DEVOTED TO
TEXTILE CHEMISTRY
AND
WET-PROCESSING
BLEACHING
DYEING
PRINTING
FINISHING

AUGUST 8, 1949
VOLUME 38, NO. 16

AMERICAN DYESTUFF REPORTER

AUG 15

THE BEST for
Cotton shirtings...
VAT COLORS

For the best in all-round fastness properties —use vat colors. Du Pont vats are suitable for all types of application. They're available in a wide range of shades for printing, duplex printing and overprinting—and for dyeing. They have the same fastness whether applied to yarn or piece goods.

Du Pont offers Ponsol*—anthraquinone-type dyes—and Leucosol*—specially prepared anthraquinone types for printing. For all cotton shirtings, look to Du Pont vat colors. Our Technical Staff will assist in solving your problems.
E. I. du Pont de Nemours & Co. (Inc.), Dyestuffs Div., Wilmington 98, Del.

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BETTER THINGS FOR BETTER LIVING ...THROUGH CHEMISTRY

OFFICIAL PUBLICATION
of the
PROCEEDINGS
AMERICAN ASSOCIATION
OF TEXTILE CHEMISTS
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KELTEX

FOR

excellent printing

with acetate, acid and direct colors on acetate, viscose and pure silk dress goods

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• You get all the advantages of good color yield and sharp line — sparkling prints that strike a perfect note in fashion's color harmony — when you use Keltex, the modern algin thickening agent.

Keltex gives you exact, unvarying printing paste viscosity; assures perfect penetration and superior printing results. It is equally effective in machine or screen printing on cotton, pure silk, wool or rayons. Gives excellent printing with direct, acetate and acid dyes or white discharge.

You get consistent uniformity and stability with Keltex because Keltex is a non-variable compound rigidly processed to exacting standards. Keltex is entirely free of grit or other foreign matter. Easy and economical to use, it requires no cooking or special treatment, and is easily removed in the final washing to give a soft and pliable hand to printed goods.

Our Technical Service Department will be glad to cooperate with you fully in advising how Keltex can meet your particular requirements. Write to our nearest regional office.

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KELTEX
REFINED ALGIN PRODUCT

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Reduces crocking and brightens Napthol shades by stabilizing Fast Color Salts and Bases.

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Votator

STARCH COOKING APPARATUS

for the continuous, closed, controlled processing of

- **STARCH PASTE**
- **VAT REDUCTION PASTE**
- **VAT STANDARD PASTE**
- **BACKFILL**

A continuous flow of material, in a closed, controlled system. That's the idea behind Votator starch cooking apparatus. It's basic. It's versatile. And the advantages of Votator starch cooking apparatus are being applied to more and more textile starch processing problems.

Generally speaking, Votator starch cooking apparatus functions in less floor space than is otherwise required and with less manpower. There is no spillage, no waste. Control over quality is mechanical, foolproof. Use of heat transfer medium is effective, economical. Continuous processing under pressure permits higher cooking temperatures than are obtainable with open kettle methods.

Write for case history facts about the application in which you are interested.

THE GIRDLER CORPORATION
VOTATOR DIVISION
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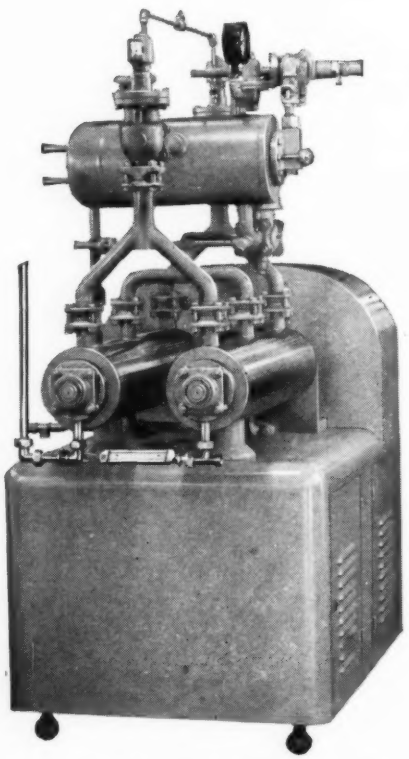
This Votator unit cooks and plasticizes 4000 pounds of smooth, homogenous backfill per hour.



When we say Votator starch "cooking" apparatus, we mean cooling, too. One Votator unit raises the temperature of vat paste to 230° F. in seconds. Then this Votator unit swiftly cools the paste as it flows through the closed controlled mechanism.

VOTATOR *is a trade mark (Reg. U. S. Pat. Off.) applying only to products of The Girdler Corporation.*

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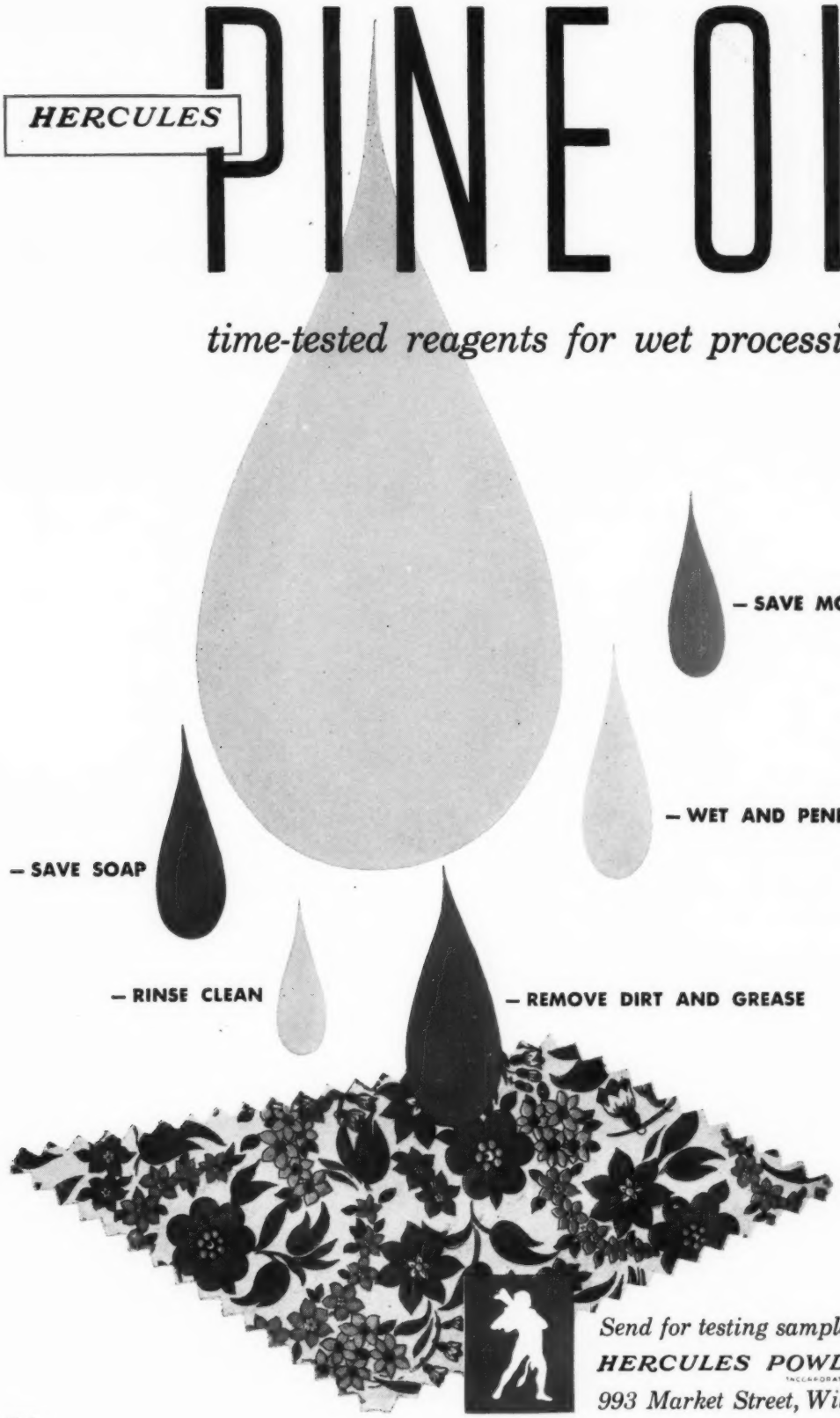
time-tested reagents for wet processing



Send for testing sample to
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. . . and the best in beautiful hosiery retains its clear dullness, its fine tone, from dye bath to consumer. Yes, no matter the denier you run, the hand you desire or the boarding method you use, Fanco finishes will seal in the beauty of your product . . . protect its loveliness throughout its lifetime. Your Fanco fieldman will gladly prove this with a no-obligation, on-the-spot test.

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In both pure and applied science, men are forever peering beyond the far horizons of the known. Practical "Virginia" chemists diligently search for new applications of the basic industrial chemicals for which they have already developed such a wide field of usefulness. They would like the opportunity of investigating possible adaptation of these versatile chemicals to *your* products or processes. You have nothing to lose—and you may gain much—by inviting them to do it.

"Virginia" **Liquid Sulfur Dioxide** (SO_2), 99.98+ percent pure, is a superior antichlor for the finishing of cotton goods. It is easy to store, to handle, and to use. Shipped in cylinders, drums, and tank cars. Send for folder today. VIRGINIA SMELTING COMPANY, West Norfolk, Virginia.

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FOR YOUR INFOR[M]ATION

MEMO

to Resin Finishers:

have you tried Catalyst AC in UREA Resin baths?

Since it was introduced, Monsanto's new Catalyst AC has paid for itself many times over in *melamine* resin baths.

Now, more and more resin finishers are getting the same profitable results with Catalyst AC in *urea* baths. Here's how Catalyst AC delivers profits with *both* resins:

LONGER USEFUL BATH LIFE than any other commercial catalyst is provided by Monsanto's new Catalyst AC. Catalyst AC gives resin baths over twice the useful life possible with earlier catalysts.

REDUCES ODOR PROBLEMS which are commonly encountered with ammoniacal catalysts.

RESIN RETENTION with Catalyst AC is equal to or better than any other commercial catalyst.

CURING RATES are equal to or faster than those obtained with diammonium phosphate.

Other advantages with this new Monsanto Catalyst include good washfastness, softer hand, compatability with softeners and penetrants, and less need for critical temperatures in pad box.

Please write for any specific information you wish on this new Monsanto research development. General technical information is available through the handy coupon.

In step with increased sales...

STED sales up

STED price down

The price of Monsanto's all-purpose detergent is down—cut from 12 to 10½ cents-a-pound as sales increase throughout the textile industry.

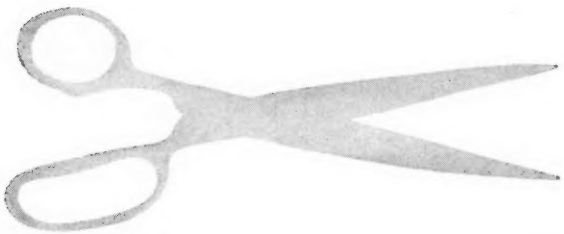
An extremely powerful detergent, Sted does a thorough job in the toughest cleaning assignment: raw wool scouring. Sted is also recommended for backwashing, desizing, kier boiling, continuous bleaching, silk degumming, hosiery scouring, and for the soaping of printed and dyed goods.

Sted's washing efficiency is not reduced in hard water; its non-sudsing characteristics prevent redeposits, an asset to easy rinsing. Despite its powerful cleaning action, Sted will not damage the most delicate textile fiber.

Send the handy coupon for full information.

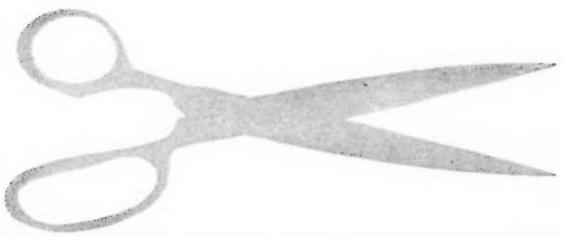
When costs are high...

Now, when operating schedules have been cut, it's more important than ever to get the last dime of profit from current production. Syton and Stymer help mill men do that with higher quality at lower cost.



SYTON for wool spinning

Woolen and worsted spinners clip costs with Syton because this dispersion gives them from 10%-to-30% more yarn strength. Added yarn strength, for example, gives mills fewer ends down during spinning and weaving . . . better roping condensation, reduced fly and card waste. Many mills report they can increase salability by spinning blends hitherto impractical. Almost all mills say they can spin any stock to a finer count with Syton. Better production, at lower cost!



STYMER acetate size

Acetate Mills produce less expensively with Stymer size which forms a tough, smooth, flexible film. In slashing, Stymer doesn't stick to uncovered dry cans, it stops static electricity troubles, and doesn't waste valuable mill time by setting in the pipes or size box. In weaving, Stymer-sized warps show little or no shedding, maintain yarn twist, and have fewer end breaks. Greater efficiency, greater economies!

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TEXTILE CHEMICALS

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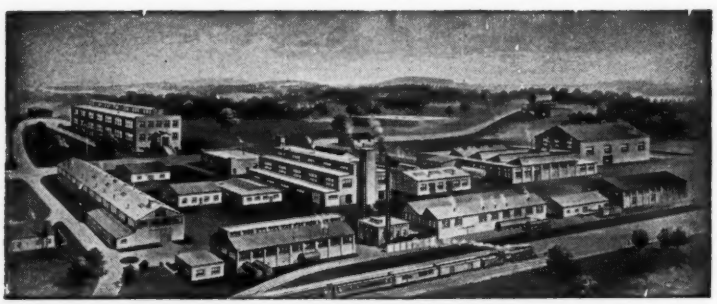
WOOL — COTTON — RAYON — ACETATE
AND MIXED FIBERS



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Hart Products

based on research

Olate TAKES MIGHTY GOOD CARE OF MAN-MADE FIBERS AND FABRICS

Your choice of a soap for scouring, dyeing and finishing man-made fibers and fabrics cannot safely be based upon efficiency alone. Some soaps are long on efficiency but short on gentleness. They can stir up plenty of grief in processing.

You'll get all the efficiency you demand when you process with Olate. But you'll get exceptional gentleness, too. The performance of this pure, neutral, low titer flaked soap is second to none. It does a superb job in raw wool scouring, in yarn finishing, in fulling and scouring woven and knitted fabrics, and in scouring and dyeing hosiery.

Olate

All down the line, Olate can help your mill smooth out production worries. You can prove it with a month's trial.

PROCTER & GAMBLE, CINCINNATI, OHIO

Safe and efficient for every textile soap usage

palatines
for wool

palatine fast dyestuffs

more production with less manpower

. . . offer the lowest coloring costs for quality results.

. . . approach chrome color fastness (without the addition of chrome) by simple acid dyeing process.

. . . are fast to light, washing, perspiration, crocking, sea water and wear.

. . . are level dyeing on mixed wool and carbonized goods without neutralization—with excellent penetration. Most types are dischargeable with Rongalite.

. . . are particularly suitable for men's wear, dress goods, gabardines, tropical worsteds, cloakings, bathing suits, knitting yarns, carpet yarns and tops.

. . . on wool-nylon mixtures they produce good tone in tone dyeings of very good fastness to light and washing.

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GENERAL DYESTUFF CORPORATION

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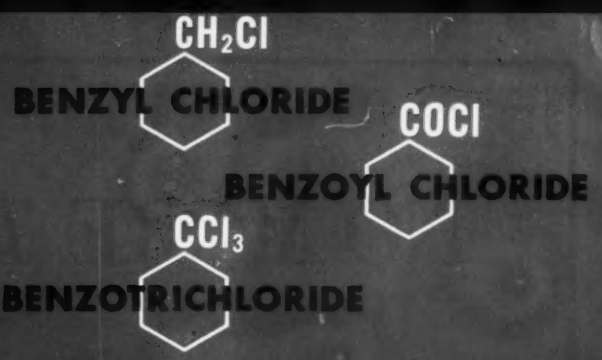

As solvents and intermediates in the manufacture of pharmaceuticals, dyes, fungicides and organic chemicals, Heyden Chlorinated Aromatics are valuable to many processes and products. The following chart indicates the extensive range they cover.

CHLORINATED Benzaldehydes	CHLORINATED Benzyl Chlorides	CHLORINATED Benzoyl Chlorides	CHLORINATED Benzotrichlorides	CHLORINATED Toluenes	CHLORINATED Benzoic Acids
Ortho Chlor Benzaldehyde Assay: 98.0% Containers: Glass carboys	Ortho Chlor Benzyl Chloride Assay: 98.0% Containers: Glass carboys	Ortho Chlor Benzoyl Chloride Assay: 95.0% Containers: Glass carboys	Ortho Chlor Benzotrichloride Assay: 98.0% Containers: Glass carboys	Ortho Chlor Toluene Assay: 99.0% Containers: Glass carboys or iron drums	Ortho Chlor Benzoic Acid, Technical Assay: 97.0% Containers: Wooden barrels
Para Chlor Benzaldehyde Assay: 98.0% Containers: Fiber drums	Para Chlor Benzyl Chloride Assay: 97.0% Containers: Glass carboys	Para Chlor Benzoyl Chloride Assay: 98.0% Containers: Glass carboys	Para Chlor Benzotrichloride Assay: 98.0% Containers: Glass carboys	Para Chlor Toluene Assay: 97.0% Containers: Glass carboys or iron drums	Para Chlor Benzoic Acid, Technical Assay: 97.0% Containers: Wooden barrels
2,4-Dichlor Benzaldehyde Assay: 97.0% Containers: Fiber drums	2,4-Dichlor Benzyl Chloride Assay: 97.0% Containers: Glass carboys	2,4-Dichlor Benzoyl Chloride Assay: 98.0% Containers: Glass carboys	2,4-Dichlor Benzotrichloride Assay: 98.0% Containers: Fiber drums	2,4-Dichlor Toluene Assay: 99.0% Containers: Glass carboys or iron drums	2,4-Dichlor Benzoic Acid, Technical Assay: 97.0% Containers: Wooden barrels
3,4-Dichlor Benzaldehyde Assay: 96.0% Containers: Fiber drums	3,4-Dichlor Benzyl Chloride Assay: 96.0% Containers: Glass carboys	3,4-Dichlor Benzoyl Chloride Assay: 95.0% Containers: Glass carboys	3,4-Dichlor Benzotrichloride Assay: 96.0% Containers: Glass carboys	3,4-Dichlor Toluene Assay: 97.0% Containers: Glass carboys or iron drums	3,4-Dichlor Benzoic Acid, Technical Assay: 97.0% Containers: Wooden barrels

Technical literature and samples will be mailed promptly upon request on Company letterhead.

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Benzaldehyde • Benzoates • Benzoic Acid • Benzyl Chloride • Bromides
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M. D. A. (Methylene Disalicylic Acid) • Paraformaldehyde • Parahydroxybenzoates
Penicillin • Pentaerythritols • Salicylates • Salicylic Acid • Streptomycin

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NO MORE *TIPPY* WOOL

with

ANTHOMINE*

on the job!

IN ALL WOOL DYEING OPERATIONS *ANTHOMINE* INCREASES THE AFFINITY OF WOOL FIBRES FOR DYESTUFFS.

THIS RESULTS IN LEVEL SHADES WHEN DYEING STOCK, YARN OR PIECE GOODS.

TIPPY AND BLENDED WOOLS ARE DYED A SOLID SHADE BY ADDING *ANTHOMINE* TO THE DYE BATH.

Mills throughout the country use* ANTHOMINE *for:

- **Even dyeing**
- **Brighter, fuller shades**
- **Quicker, better exhaustion of dyebath**
- **Softer, more pleasing "hand"**
- **Reduced processing time**

Send for Technical Service Bulletin #203-100.2 for complete information, including how to use ANTHOMINE for Top and Yarn Dyeing, Pressure or Package Dyeing, Leveling Unevenly Dyed Yarn or Shady Pieces, Dyeing Metallized Colors, etc.

Arkansas Co. INC.

Manufacturers of Industrial Chemicals for Over 40 Years

NEWARK, NEW JERSEY

*Reg. U.S. Pat. Off.

pick and shovel days are over

Bull-dozers and steam shovels ended pick and shovel methods in earth moving. So modern strip mill facilities banished pick and shovel techniques in rolling stainless sheet and strip. Climaxing this progress, CRUCIBLE, a *specialty steel* producer for half a century, has built an $18,000,000 mill at Midland Works *specifically* for rolling stainless steel—the *first mill* that has ever been built to take complete advantage of the *best* in stainless rolling practice.

You would expect this of CRUCIBLE. You would expect that the top organization in the *specialty product* field would make stainless as a specialty—and you would be right. Here at Midland, hot and cold rolled stainless sheet and strip are made in widths from ½″ to 50″ inclusive, in all gauges, grades and finishes, with the same precise quality control that has made CRUCIBLE the leader in special service steels for generations.

Moreover, with Trent Tube Co. joining the organization you can now turn to CRUCIBLE for *every* type of stainless—sheets, plates, strip, bars, tubing, forgings, wire and castings. Data sheets are available for all grades. Your inquiries will have prompt attention.

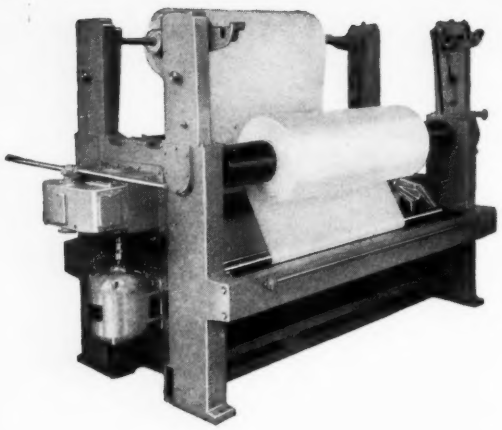
CRUCIBLE STEEL COMPANY OF AMERICA
405 Lexington Ave., New York 17, N.Y.
Branches, Warehouses and Distributors in Principal Cities

for stainless sheet and strip

CRUCIBLE first name in special purpose steels

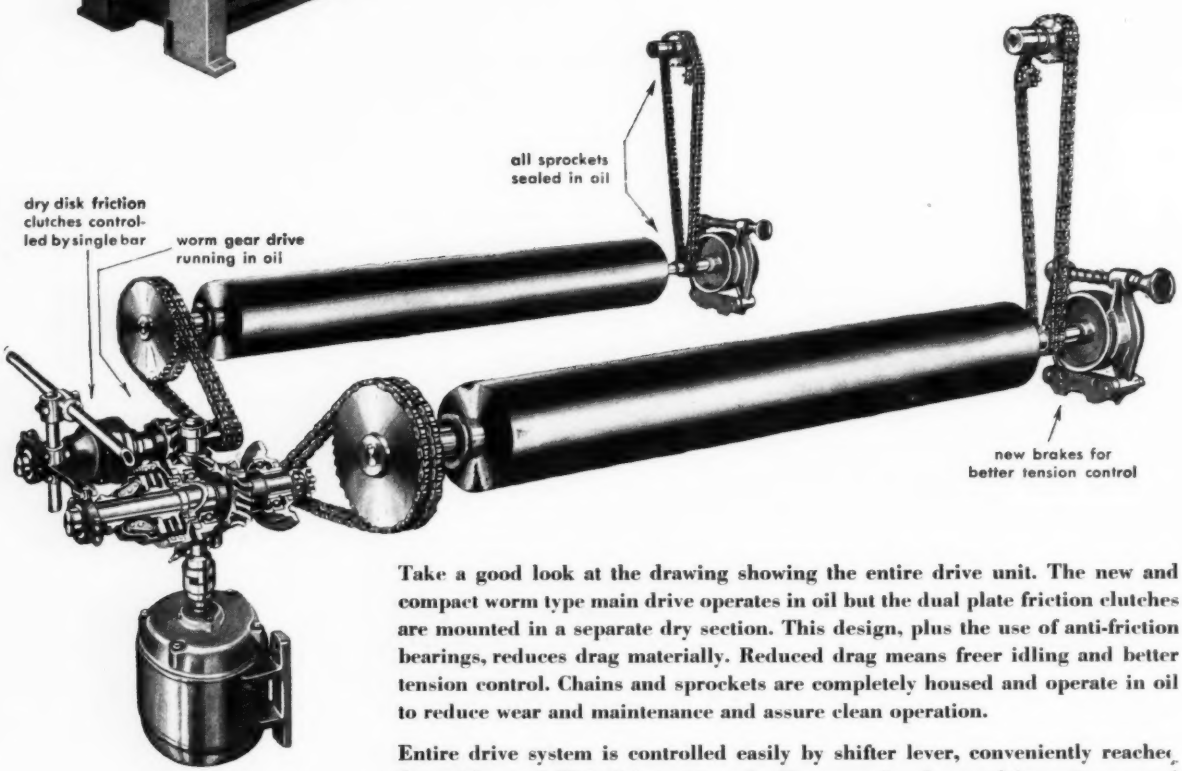
hot and cold rolled STAINLESS SHEET AND STRIP

STAINLESS • HIGH SPEED • TOOL • ALLOY • MACHINERY • SPECIAL PURPOSE • STEELS



LOOK TWICE AT THIS *New* JIG

Van Vlaanderen has set an entirely new standard in jig performance with this machine. Better tension control, drag-free idling, easier and cleaner operation, capacity for larger cloth rolls and better production are all here, enabling you to produce better quality goods at lower costs.


all sprockets sealed in oil
dry disk friction clutches controlled by single bar
worm gear drive running in oil
new brakes for better tension control

Take a good look at the drawing showing the entire drive unit. The new and compact worm type main drive operates in oil but the dual plate friction clutches are mounted in a separate dry section. This design, plus the use of anti-friction bearings, reduces drag materially. Reduced drag means freer idling and better tension control. Chains and sprockets are completely housed and operate in oil to reduce wear and maintenance and assure clean operation.

Entire drive system is controlled easily by shifter lever, conveniently reached from either end. Main drive unit can be dismounted and spare drive unit mounted in half hour—a valuable aid in keeping production at the peak where the number of machines in operation justify a spare drive unit.

Other important features: heavy vibration-free cast iron side frames, stainless steel tank, 7 ¼″ rubber covered rolls, new overflow arranged sideways, guide rolls stainless steel. Oscillating type expander unit with stainless steel curved bars and immersed rolls. Guide rolls mounted on special stainless steel roller bearings. Better tension control with redesigned malleable iron brakes and tension indicator permit quick, accurate readings. Other type brakes if desired.

We have made arangements to show you this machine in actual plant operation.

Also

Van Vlaanderen builds a constant-speed, tensionless dyeing machine which is the standard of value where tensionless dyeing is important.

VAN VLAANDEREN MACHINE COMPANY

370 Straight Street • Paterson 3, New Jersey

World's largest manufacturer of machines for processing modern fabrics

by Dr. L. J. Armstrong, Textile Processing Consultant, Armour and Company

Fatty Amides: THEIR PROPERTIES AND THEIR USES

A primary amide may be described as a derivative of an organic acid in which the (OH) group has been replaced by an amino (NH_2) group. This forms a substantially neutral chemical called an amide ($RCONH_2$).

The name "Armid" is the Armour trade-name given to the general class of amides derived from fatty acids. Since fatty acids are all straight-chained molecules, the Armids are likewise straight-chained.

General Properties

These high molecular weight amides are high-melting, wax-like materials. The chemically pure amides are water-insoluble and neutral. Commercially, the Armids may contain a few percent of the unreacted fatty acids from which they are made.

The Armids vary in physical properties from a substance which can be flaked like stearic acid to a soft paste. The color of the saturated amides is lighter than that which can be obtained on the unsaturated amides.

Solubilities

The Armids are soluble in ketones, esters, alcohols, turpentine, mineral spirits, fats and fatty acids. They are not soluble in water.

In general, amides are insoluble or only slightly soluble in organic solvents at room temperature, and increase in solubility at high temperatures.

In the saturated series the longer the carbon chain of the amide, the less is the solubility. In each class of solvents, the higher the molecular weight of the solvent, the more amide it will hold in solution.

Chemical Properties

Unsubstituted amides react with ethylene oxide to yield mixtures of mono- and di-substituted amides (available commercially from Armour Chemical Division as "Ethomids") which range from dispersible solids to soluble waxes. Suitable choice of amounts of ethylene oxide give good wetting agents and excellent cotton detergents when properly formulated.

Reactions of amides with formaldehyde, depending on the conditions, may give methylol stearamide or methylene bis stearamide (Armowax). Methylol stearamide undergoes a number of interesting reactions leading to textile waterproofants, surface-active agents and high-melting waxes.

Amides may be chlorinated by reaction with a sodium hypochlorite. These compounds offer many interesting possibilities for further synthesis of wetting agents, textile softeners, waterproofing agents, detergents, etc.

Availability

The Armids which are available in quantity for commercial use are shown below in tabular form, together with their average composition and constants.

Technical information, samples and prices are available upon request. (Any indication of your particular field of interest will be helpful to our Technical Service Department in making recommendations.)

High Molecular Weight Aliphatic Amides—Composition and Constants Chart

n-Primary Amides	Carbon Chain Length	Armid 8	Armid 10	Armid 12	Armid 14	Armid 16	Armid 18	Armid HT	Armid RO	Armid T	Armid TO	Armid C
Hexane	6	3	..	..	..	..	..	..	..	..	..	..
Octane	8	90	3	..	..	..	..	..	..	..	..	8
Decane	10	7	90	..	..	..	..	..	..	..	..	9
Dodecane	12	..	7	90	4	..	..	..	..	..	..	47
Tetradecane	14	..	..	9	90	..	..	..	..	..	..	18
Hexadecane	16	..	..	..	4	90	6	25	..	30	..	8
Octadecane	18	..	..	..	..	6	93	70	20	25	..	5
Octadecene	18	..	..	1	2	4	1	5	60	45	30	5
Octadecadiene	18	..	..	..	..	..	..	..	20	..	30	..
Substituted Cyclic	20	..	..	..	..	..	..	..	..	..	40	..
Approximate Melt Point °C		97	97	97	97	97	100	98	72	80	55	90
Approximate % Unreacted Fatty Acid		5	5	5	5	5	5	5	5	5	5	5

Textile Applications

Textile chemists are constantly striving to effect improvements in the appearance, durability and performance of yarns and fabrics. The Armids are playing an ever-expanding part in broadening the scope of the field of textile chemistry. While new uses are being discovered regularly, the Armids already have found acceptance in the following:

Emulsions: The Armids are emulsified with oleate soaps and applied to fabrics for their water repellent and softening properties. Similar emulsions are used in small quantities in starch sizing pastes and other gums to minimize sticking.

Emulsion Additives: Generally, Armids thicken, stabilize or increase spreadability of an emulsion when added to the extent of 1-5% on the basis of the oil phase to be emulsified.

Mutual Solvents: The Armids make many synthetic resins compatible with paraffin or microcrystalline waxes — make possible a wide range of unique compounds with certain of the desirable properties of both plastics and waxes.

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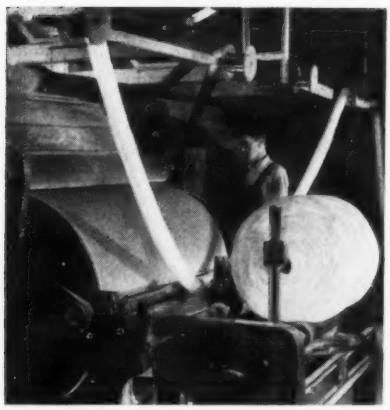

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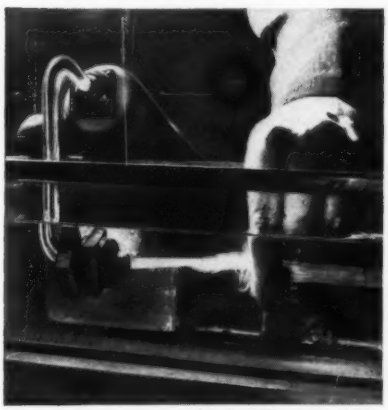

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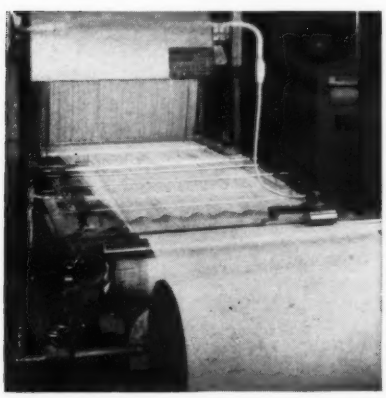

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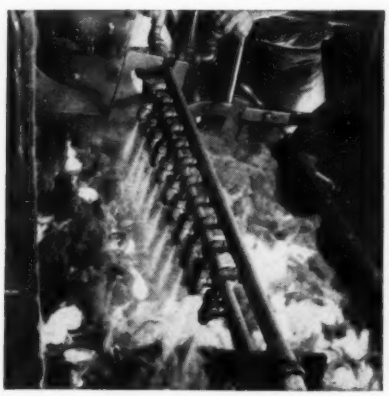

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Then someone said, "Maybe we're not buying carefully enough," and they all looked at the Purchasing Agent.

"Well," admitted the Purchasing Agent, "I've been thinking about all the Calgon we buy. Maybe we could save there."

"And maybe," the Chief Chemist said, "we could cancel our insurance."

The President roared, "Cancel our insurance . . . "

"HE MEANS," the Plant Manager hastened to explain, "that Calgon *is* insurance. He's right. We use it all through our water supply system. Calgon stops scale and corrosion. Saves us a lot on maintenance."

"That's only your end of it," the Chief Chemist pointed out. "Calgon reduces iron pick-up, and we get better results in the dye house."

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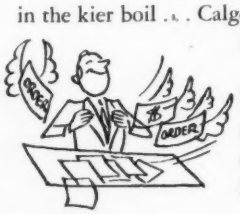
"CALGON doesn't *cost* us money," he concluded, "it saves us money. If I had to bleach and redye a single batch it would cost more than we pay for Calgon all year."

"Look, boys," the Sales Manager broke in, "I'm no expert on Calgon but I know plenty about what'll happen to sales if off-shade stuff starts going out to my customers. Selling is tough enough now, even with top quality."

"And that," the Purchasing Agent said, "means Calgon in the kier boil . . . Calgon in the scour and rinse . . . Calgon in sizing gray goods . . . Calgon in."



"OF COURSE, of course," the President interrupted, "we're all agreed that we're already cutting costs with Calgon.* Any *other* ideas?"

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Moisture	1.70%
pH (1% solution)	7.50%

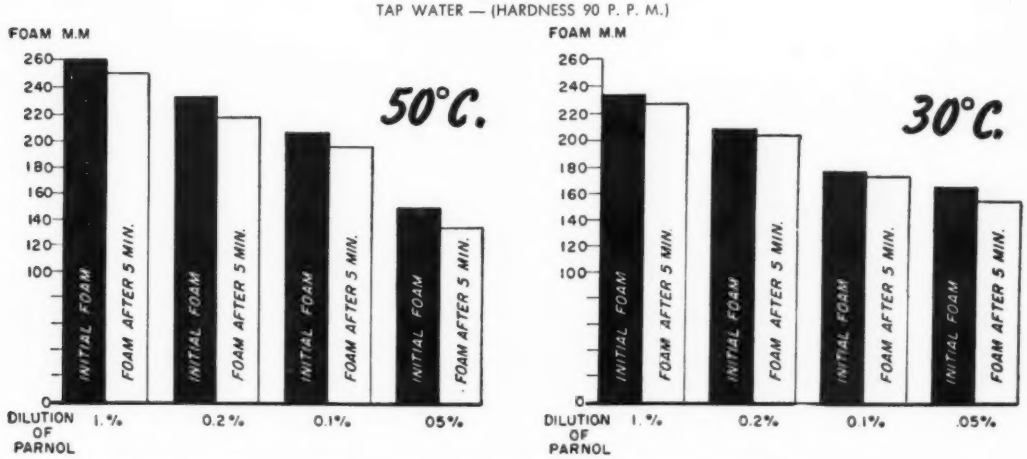
DRAVES WETTING TEST

TAP WATER — (HARDNESS 90 P. P. M.)

DILUTION	TIME
0.25%	6 sec.
0.20%	10 sec.
0.15%	12 sec.
0.10%	15 sec.

ROSS-MILES TEST

TAP WATER — (HARDNESS 90 P. P. M.)



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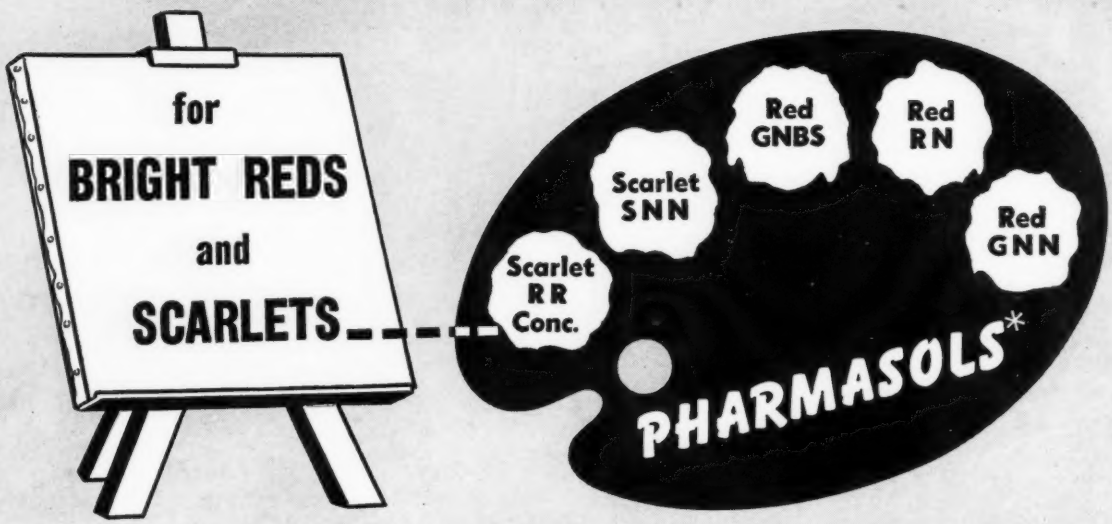

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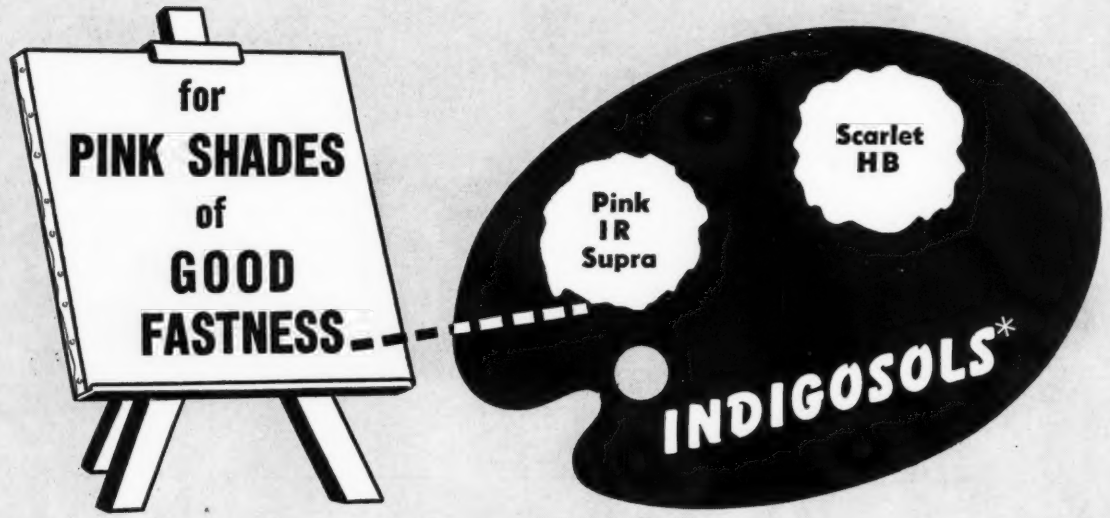

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AUGUST 8, 1949

VOLUME 38 NUMBER 16

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VOLUME 38 AUGUST 8, 1949 NUMBER 16

THE CONDITIONS OF TEMPERATURE AND HUMIDITY IN THE FADE-OMETER

G. NORDHAMMAR
Swedish Institute for Textile Research, Gothenburg, Sweden

Introduction

IT is well known that the Fade-Ometer is not a precision instrument but may change its properties from one occasion to another *(1)*. This fact causes a lot of trouble, and it has long been tried to improve the apparatus but without great success. When using the Fade-Ometer for light fastness testing it was suspected that one source of error might be that the rate of fading was dependent on the number of samples in the apparatus, and this might give rise to a difference between the prevailing temperatures of the samples. This suspicion lead us to investigate the temperature conditions and later on also the humidity in the apparatus. The type of Fade-Ometer used was FDA-R, (Atlas Electric Devices Co.) adapted with a lower specimen holder ring. The change of the rate of fading is different for different colors. For Calibration Paper A the influence of temperature can easily be demonstrated by exposing two test pieces at the same time; one of them mounted in the ordinary way in a Fade-Ometer Test Mask, the other one with an opening in the mask to obtain free ventilation also to the back of the paper. Because of the better cooling in the last case, this paper will fade less than the other one.

Temperature Conditions

From the burning carbon arc, heat is transmitted by radiation, convection and conduction. The temperature of samples depends partly on the temperature and velocity of the surrounding air and partly on the radiation absorbed. The absorptivity depends on the surface properties of the samples, so the temperature of, e.g., a white and black sample is not generally the same, but it is always higher than that of the air. The temperature of the air as well as the heat transmission from sample to air are functions of the air flow. When this is changed, e.g. when the number of specimens is different, the temperature conditions also change. In many investigations of these matters the thermometers and the other instruments used have not been suitable, or consideration has not been given to all variables present. A very valuable report has been given by R. O. Hall *(2)* and many of his conclusions have been confirmed by us in this investigation.

As the fading occurs in the very surface of the fabric exposed, it is the surface temperature that is most important, and this fact has also been pointed out by Goodings *(3)*, Hall *(2)* and others. But as mentioned above, absorptivity affects the surface temperature. Therefore it is reasonable first to investigate the temperature of the air, which is more constant.

In all experiments it is advisable to use recording instruments where it is possible and especially where uncontrolled variations are likely to occur. In the case of temperature measurements this can be done in several ways. We found thermocouples connected to a recording potentiometer to be most suitable.

Four 0.5 mm. copper-constantan thermocouples were fixed between the globe and the specimens in the Fade-Ometer, at different distances from the carbons and at the same height as the middle of the samples. Because of the revolution of the specimen holder, no thermocouple could be placed just up to the surface of the fabric but the temperature here can easily be estimated by extrapolation. In order to avoid heating of the junctions by direct radiation they were protected by two brass screens (Fig. 1). The temperature fluctuated rapidly (Fig. 2) and when only a mean value was wanted it was found suitable to increase the mass of the junction with a piece of copper about 0.5 gm. in weight. Even then there was a remarkable fluctuation but not so rapid (Fig. 2).

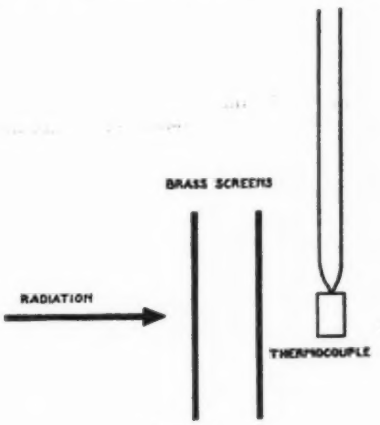


Figure 1
The thermocouple is protected from direct radiation from the arc by two brass screens.

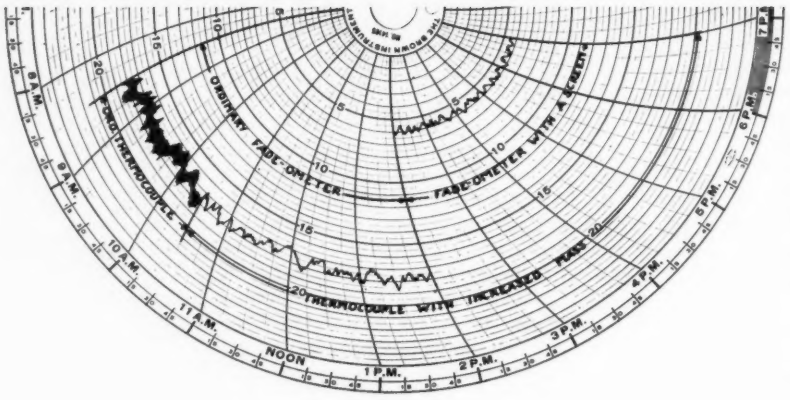


Figure 2

Chart from the recording potentiometer, registering the temperature near the surface of the samples. One unit = 2.4°C. above the temperature of the cold junction (17°C.)

This is the same fluctuation as that found by Hall and is fully accounted for by the flame moving from one spot of the carbons to another and from one of the lower carbons to the other. In Fig. 3 curves for temperature versus distance from the center of the carbons are shown. The curves are plotted as mean values from measurements with several sets of carbons. The estimated value at the sample surface with a full set of samples (21 samples) varied about ± 5°C. between different series of measurement. There is a very significant difference between the value of 55°C. for a full set of specimens and the value of about 30°C. for five specimens. These figures show the importance of always having the same number of specimens both at temperature measurements and at ordinary light fastness testing. A set of 21 samples, which fully utilizes the capacity of the apparatus, will certainly most often be chosen. The surface temperatures in the following always were measured with 21 samples in the apparatus.

To measure a surface temperature correctly is a rather delicate job, because most measuring units will disturb the ordinary conditions of the surface. Often the best way is to use a thermopile but this is hardly possible to use in the Fade-Ometer without affecting the radiation of light or the flow of air. A method with thermocouples in the surface was used here, and although the procedure may be not quite without objections it provides a good mean at comparisons and the temperatures measured are at least not higher than the true ones, as will be shown. Wires, 0.3 mm. in diameter, of copper and constantan resp., were welded together not side by side as is generally done, but along each other. The resulting wire obtained was threaded as a yarn parallel to the warp in the surface of a wool fabric. In this way the great temperature gradient from the front of the material to the back of it was avoided in the thermocouple near the junction. On the other hand there is some risk that the temperature measured will be due more to the properties of the metal wires than to those of the fabric. For oxidized copper the emissivity is about 0.6 and for constantan about 0.1. For wool the values given in literature seem to be rather uncertain, but 0.7-0.8 is certainly not too high. This means that the thermocouple absorbs less heat than the surrounding fabric and the temperatures obtained would at least not be higher than those of the fabric. Both fabrics used consisted of unbleached wool, one of them dyed with 5% Ciba Acid Black 2BNN and the other one undyed. The surface temperature fluctuated very much with a mean value for the black sample of about 90°C. and temperatures of more than 100°C. during short intervals. The white sample was a few degrees lower in temperature. These temperatures seem to be rather high and it may be interesting to compare them with those met in practice and in the standard sun test.

In both of these cases there is no temperature control and the conditions may vary considerably from one time to another. As it is therefore very difficult to settle a mean temperature it was tried instead to find a high temperature likely to occur. The same thermocouples and fabrics as in the Fade-Ometer investigation were used and in the case of "practical use" the samples with the thermocouples were fixed on the back of a sitting person, the samples facing the sun. The tests were carried out in Gothenburg (latitude 58°N.) on days in the summer of 1948 when the sky was very clear and there was only a very light breeze blowing now and then. The temperature of the day was about 27°C.

The highest temperature found was 68°C. for the black fabric and about 10°C. less for the white one. Even very light breezes lowered it about 5°C. and a little 8 inch propeller fan at a distance of about 1 yard caused the temperature to fall about 15°C. The 68°C. found denotes no ultimate value of course, but as

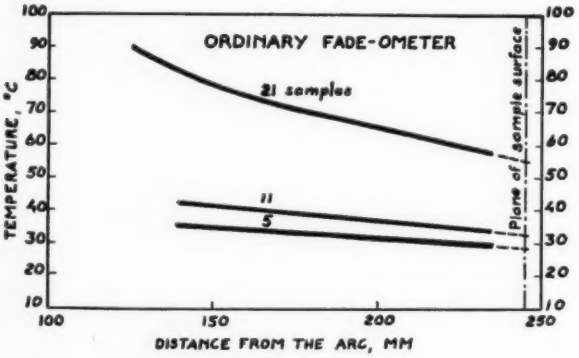


Figure 3

The temperature of the air is rather high in an ordinary Fade-Ometer and is highly dependent on the number of samples.

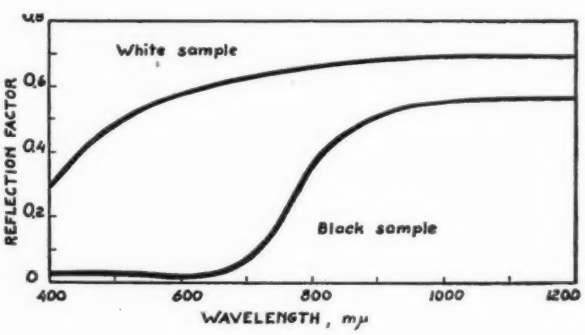


Figure 4

Reflection factors at different wave-lengths for two samples used in the measurement of surface temperatures.

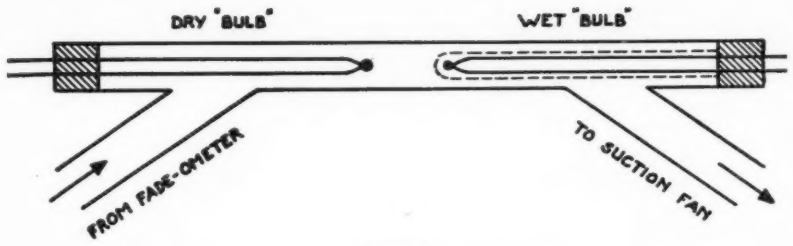


Figure 5
Wet and dry bulb hygrometer with thermocouples.

either the fabric or the air is generally in movement, it is certainly not often met outdoors in practice except in the tropics. Another experiment was made with the person sitting indoors behind a window. The highest temperature observed was 60°C. but this value is certainly far from exceptional for curtains and similar articles exposed to the sun rather close behind a window. Also in the standard sun test the fabric is in similar position and for comparison some measurements were made on a standard bench, the sample being about 3 cm. from the glass. With the cover shut, the maximum "black" temperature found was 90°C. and this value was also measured when the cover was slightly open but no wind blowing at all. By ventilating the bench with a fan the temperature was lowered about 25°C. In all measurements of surface temperature where the sample was exposed to the sun the "white" temperature was about 10°C. less than the "black" one while the difference in the Fade-Ometer was not more than about 3°C. This different behavior is easily accounted for by the reflection curves (Fig. 4) for the two colors when it is remembered that the infrared radiation is proportionally greater from the arc than from the sun *(4)*. As is seen from Fig. 4 the properties of the white and black fabrics in the infrared region are rather similar, and this fact will render also the temperatures more close to each other.

Humidity Conditions

For many dyes the light fastness is certainly dependent on the relative humidity during exposure *(5)*. The photochemical reactions take place in the fibers on the surface of the sample. Therefore it is of interest to determine the relative humidity at the surface or the moisture content of the surface fibers. This is a very difficult task because of the humidity and temperature gradients both outside and within the cloth. The relative humidity in the warm surface will not be the same as that in the interior or at the back of the fabric.

The moisture conditions of the air are more easily treated though there are some difficulties in the measuring procedure as will be shown later on. If there was no addition of water in the Fade-Ometer the absolute content of moisture would be the same in all parts of the apparatus reached by the flowing air and would be the same as in the surrounding air and in this case it would be very simple to calculate the relative humidity at any spot when the temperature there is known. As is shown in the preceding paragraph the temperature varies along the radius, which means, that the relative humidity is not constant either. It is thus necessary to state where a given value of the relative humidity has been measured or calculated.

With a humidifier too, the moisture content is likely to be the same in all parts because of the turbulence of the air but these things ought to be measured. It would be natural perhaps to use wet and dry bulb thermometers at the place to be examined, but this is not a good solution. To get a good evaporation from the wet bulb the speed of the air passing by must be rather high, about 2 m./sec. which is appreciably higher than the air

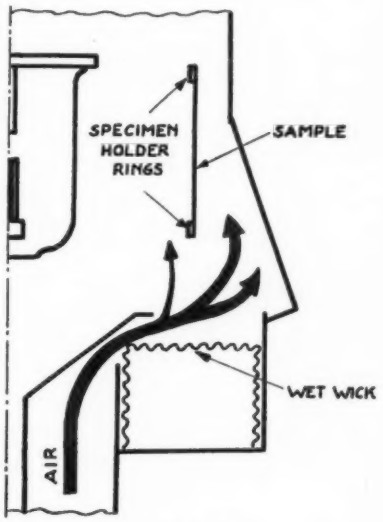


Figure 7
Section of the Fade-Ometer, showing the distribution of air.

speed in the Fade-Ometer. This can be increased of course by a separate fan above the thermometers but this disturbs the condition to be measured. In the experiments described here another arrangement was used. The ordinary mercury thermometers used for the wet and dry bulbs were exchanged for thermocouples and placed outside the Fade-Ometer in a special narrow casing. One end of this was connected to a suction fan (Fig. 5) and from the other end a rubber tube was drawn to the Fade-Ometer and ended at the place where the moisture content was to be determined. The dimensions of the thermocouples allow the tube to be so narrow, that only a very small amount of air was necessary to obtain the required speed, and the conditions in the apparatus were not appreciably disturbed. The air was cooled, of course, while drawn from the Fade-Ometer to the psychrometer, but during our measurements it never reached the dew point before or at the thermometers, and the moisture content

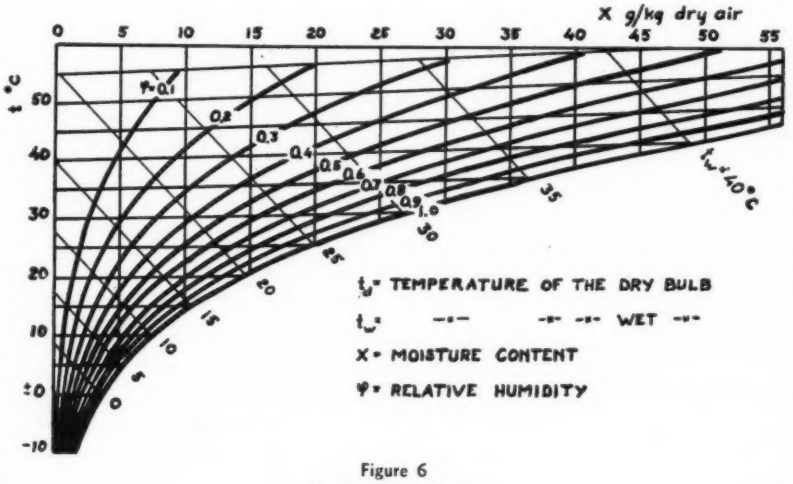


Figure 6
Psychrometric chart.

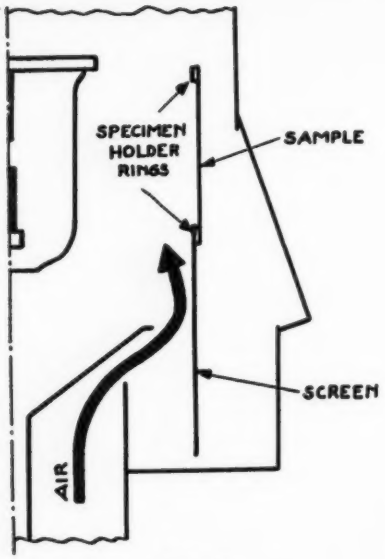


Figure 8
By placing a screen in the Fade-Ometer, the air is forced to pass in front of the samples.

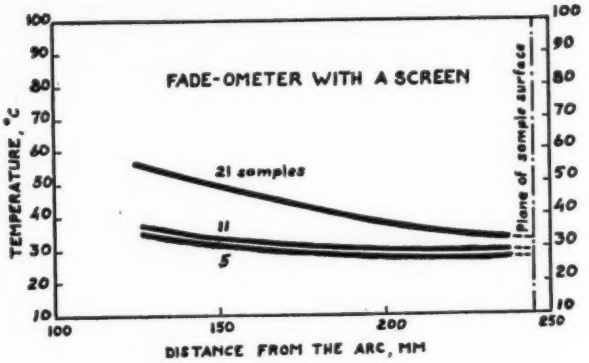


Figure 9
By inserting a screen according to Figure 8 in the ordinary Fade-Ometer, the temperature of the air is lowered and is less dependent on the number of samples.

could therefore be determined from a psychrometric chart. Measurements with the tube end at different distances from the arc gave no significant differences between moisture contents and the assumption made above is thus proved. This suggests a very simple method of measuring the humidity because an ordinary wet and dry bulb psychrometer can be used, if it is placed at the air exit on the top of the apparatus.

All measurements gave a value of the moisture content in the apparatus only slightly higher (about 0.5 gm./kg. dry air) than that in the surrounding air. This fact is easily understood from a psychrometric chart (Fig. 6). From this it is seen, that air of 20°C. and 65% relative humidity (R.H.) has a moisture content of about 9.5 gm. water/kg. dry air. If there is no extra supply of water this air, when heated to 55°C. at the surface of the samples, will have a R.H. of about 10% (Ψ =0.10). According to measurements, the air passing by the wicks in the Fade-Ometer is of about room temperature (in this example 20°C.) so a possible decrease in temperature because of evaporation is compensated by heat transmission from the arc. The maximum content of water at this temperature is 15 gm./kg. dry air corresponding to 100% R.H. If it was possible in some way or another to give the air such an amount of water, the R.H. at 55°C. should nevertheless not be more than about 15%. In an ordinary Fade-Ometer there is no risk of reaching 50% prescribed as the maximum value in the A.A.T.C.C. specifications for light fastness testing. With a spray-type system for humidification it might be possible to add 90% of the amount of water necessary to get 100% R.H. The measured content of 0.5 gm./kg. dry air corresponds to only 0.5/(15-9.5) = 9% and this value is quite reasonable for the rather non-effective wet-wick system used in the Fade-Ometer. The relative humidity at 55°C. will change from 10% to about 11% by this supply of water. From this it is clear that the present humidification system in the Fade-Ometer is of little value. A change of the relative humidity of the air in the room at 20°C. from for example 30% to 70% causes a much bigger change of the moisture content, from 4.5 to 10 gm./kg. dry air, e.g. from 5% R.H. to 11% R.H. at 55°C.

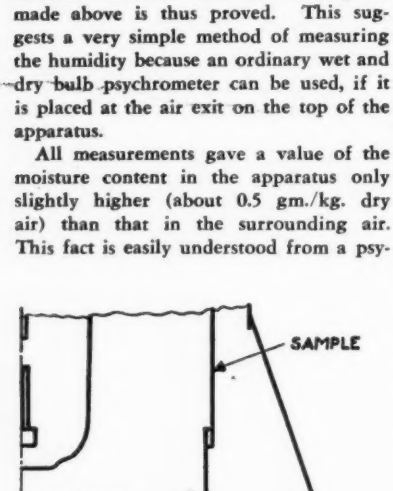


Figure 10
By a change in the position of the wet wicks, the air is forced through the wicks and the humidification improved.

Improvements of the Conditions in the Present Fade-Ometer

The primary source of the high temperatures within the Fade-Ometer is the excess of infrared radiation from the carbon arc, and the most rational way to improve the conditions would be to diminish this range of the spectrum emitted. As it is hardly possible to change the light source itself to any large extent, the heat may be absorbed in a filter. Water in an ultraviolet-transmittent glass container is a very suitable medium for this purpose and has been used in an English type of artificial light source *(6)*. In the present Fade-Ometer, however, such an arrangement would prevent easy handling of the apparatus, especially by the installation of a new trim of carbons. However, it is possible to improve even the now existing model FDA-R (the exact construction of the other models is not known to us) by very simple means. A section of the apparatus is shown by Fig. 7. It is obvious that most of the air passes behind the samples. By placing a screen below the samples, as shown by Fig. 8, the air was forced to pass in front of them. The effect was remarkable as illustrated by the curves plotted in Fig. 9 which should be compared with Fig. 3 where the values were obtained in the same way but without this extra screen. The estimated temperature of the air just to the surface has fallen from 55°C. to about 35°C. with 21 samples and the temperature is less dependent on the number of samples.

The relative humidity is increased far more by lowering the temperature than by the present humidification system. Air of 20°C. and 65% R.H. will thus have about 26% R.H. at 35°C. without an extra supply of water. When the relative humidity of the surrounding air varies between 30% and 70% the corresponding change at the samples is from 12% to 28%. Whether this variation has any influence on the rate of fading has not been considered in this investigation. If it has, a testing apparatus must be provided with some effective humidifier, and if the humidity of the surrounding air is not kept constant, there ought to be some automatic

(Concluded on Page 593)

PERMANENT FINISHES ON VISCOSE RAYON DEPENDING ON CROSS-BONDING*

W. G. CAMERON and T. H. MORTON

Abstract

Evidence is presented which demonstrates the existence of cross-bonds in the molecular structure of nine modified viscose rayons. In a resin treatment, e.g. the urea-formaldehyde anti-crease process, the greater part of the material is deposited between the molecules of cellulose in the amorphous regions of the fiber. The change in fiber properties, however, is due mainly to a much smaller amount of reactant actively cross-bonding adjacent molecules. In technically important modifications of viscose rayon there is one cross-bond to each 40-100 glucose residues of the fiber cellulose. In the majority of instances the behavior of the cross-bonds can be adequately represented by definite structural formulae. The cross-bonds studied differ widely in stability, and the technical importance of this point is indicated.

The technical processes depending on cross-bonding are reviewed, and the anti-crease process is discussed.

Molecular Structure of Viscose Rayon

SINCE all the mechanical and chemical properties of any textile filament theoretically can ultimately be referred to its molecular structure, it follows that changes in mechanical properties due to cross-bonding treatments must similarly be related to changes in the molecular structure of the fiber.

The structure or texture which is now generally accepted for regenerated cellulose fibers, for viscose in particular, may be summarized thus—

The molecules forming the filament are very long, ranging from 400 to 10,000A in length by 5A thick. In a viscose filament as usually spun, the molecules are *oriented*, i.e. they are disposed so that the length of the molecules is more or less parallel to the axis of the fiber. This is shown diagrammatically in Fig. 1, where the enlarged transverse section *A* is shown in relation to the dimensions of a normal viscose filament of about 7 denier. The molecules in the figure are, for convenience, represented in one plane, although this is not strictly correct. In general, the molecules (here represented as dissected from their fellows) run more or less parallel to the axis of the filament and show a wide variation in length.

If the transverse section of the molecules *A* is now magnified again tenfold (to 400,000 diameters), the disposition of individual molecules in relation to their neighbors can be indicated diagrammatically *(B)*.

There are regions where the molecular chains run strictly parallel, where the arrangement is in strict crystal order. These regions, marked *b* in Fig. 1*B*, have been termed variously *micelles, crystallites,* or *crystalline regions.* In the case of cellulose they survive wetting, drying, and treatment with many reagents, as is shown by the X-ray crystallographic evidence. For the purpose of the discussion of cross-bonding they may be regarded as permanent structures in the molecular texture of the fiber.

Between the crystallites the chains are roughly, but not strictly, parallel, and in these amorphous regions *(a)* the molecular chains are in sufficient disorder to prevent definite X-ray reflections. It is believed that the amorphous regions comprise 50-70% of a viscose rayon fiber.

Various reagents can be introduced into the amorphous regions, and, as will be shown later, can be induced to link two adjacent molecular chains by a bridge of chemically linked atoms, i.e. a cross-bond or cross-link. Such cross-bonds are shown diagrammatically at *c* in Fig. 1*B*.

The model can be employed to interpret the behavior of viscose fibers, especially in respect to the change in behavior following the introduction of cross-bonds.

When a viscose rayon fiber is immersed in water it absorbs or imbibes approximately its dry weight of water within the structure, its dimensions, especially transverse, increasing simultaneously. The imbibed water must be accommodated in the amorphous regions, since the crystallites are unchanged, so that the molecular chains in the amorphous regions move apart, giving a disposition of molecules very similar to that to be expected in a concentrated solution. Introduction of strong cross-bonds into the dry structure tends to prevent this separation of the molecular chains, so that the resulting structure must be expected to take up less water, i.e. its imbibition to be reduced.

The tensile rupture of a viscose rayon fiber occurs mainly by the irreversible slipping of adjacent cellulose molecules over each other. With application of increasing stress the fiber elongates, at first with reversible elasticity (the fiber structure being strained without internal slipping occurring), and then irreversibly with increasing speed until rupture takes place. Strong cross-bonds between adjacent molecules reduce the possibility of internal slipping, so that the cross-bonded fiber may be expected to show a greater reversible elasticity at low loads, and less plasticity or irreversible extension at higher loads. Further, the plasticity will be even more noticeably reduced for wet fibers, since cross-bonding also reduces the amount of water taken up.

The diffusion of large molecules within dry viscose cellulose is infinitely slow, but relatively rapid in the water-wet fibers. This is due to the structure of the amorphous regions noted *above*. Cross-bonding may be expected to decrease the effective pore size in the amorphous regions and so to make the penetration of the wet structure more difficult for materials with relatively large molecules such as dyes.

The foregoing deductions from theoretical considerations will be compared with observations in later sections of this paper.

* Presented at meeting of London Section, Society of Dyers and Colourists, November 7, 1947. Reprinted from their "Journal", October, 1948.

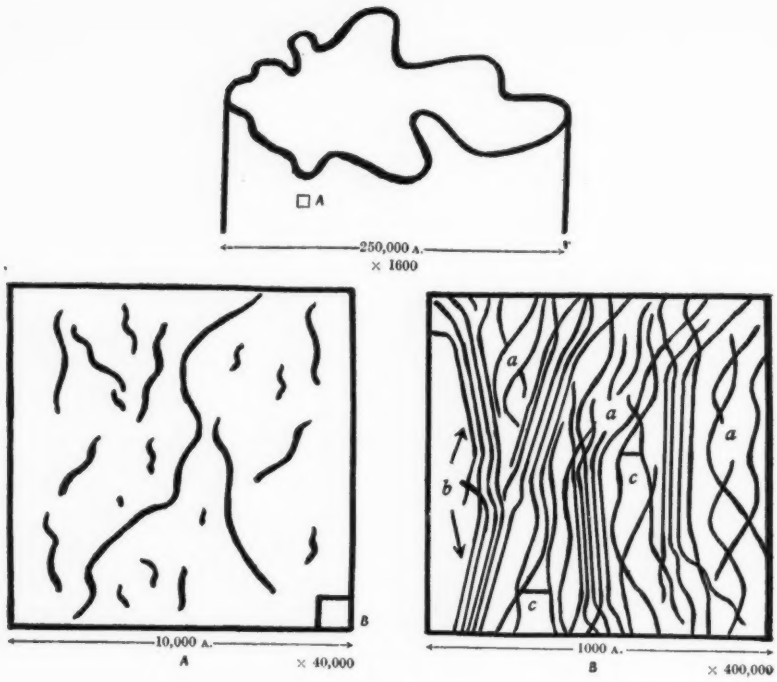
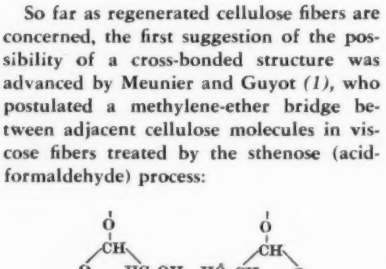


Fig. 1

Although the above discussion has been confined to viscose rayon fibers, similar considerations are valid for all fibers based on organic macromolecules.

Present State of Cross-bond Theory

So far as regenerated cellulose fibers are concerned, the first suggestion of the possibility of a cross-bonded structure was advanced by Meunier and Guyot *(1)*, who postulated a methylene-ether bridge between adjacent cellulose molecules in viscose fibers treated by the sthenose (acid-formaldehyde) process:



(I)

Similar considerations have led to the formulation of definite cross-bonds in other macromolecular substances such as vulcanized rubber *(2)* and wool *(3)*.

Since Meunier and Guyot's original suggestion, the literature of cellulose contains many references to the effect of cross-bonding in processes depending on the impregnation of aldehydic or resinous condensation compounds. In no case, however, is the suggestion of cross-bonding based on adequate experimental evidence, and in recent years the theory has fallen into considerable disrepute.

The impregnation of the viscose fiber with an acid-catalyzed urea-formaldehyde resin has received much attention. Wood, who has had considerable experience in this field, has declared that the modification of viscose by the anti-crease process is in no way due to the formation of cross-bonds, but is rather due to the presence of amorphous resin deposited interstitially in the fiber *(4)*. Although it is not clear from a theoretical viewpoint how such a structure could explain the observed properties of the modified fiber, yet it must be admitted that any alternative theory is not well founded experimentally.

On the basis of an examination of a large number of reactions of viscose involving possible cross-bonding, we believe that in most cases a true picture lies intermediate between the two extreme views noted *above (5)*. Thus, in the case of a viscose fiber modified by a typical anti-crease treatment, we believe that of a resin content of, say, 15%, about 1% is active in forming definite cross-bonds, and the remainder is deposited interstitially in the amorphous regions of the fiber; and that the resin of both categories is effective in modifying fiber properties.

Diagnosis of the Presence of Cross-bonds

The examination of a large number of modified viscose fibers indicates that certain simple tests are diagnostic of the presence of cross-bonds in the fiber structure. These tests have to be used with discretion, since due regard must be paid to the possibility of destruction of the cross-bonds under the conditions of the test. With this proviso, the results of the tests are mutually confirmatory.

(a) IMBIBITION VALUE.—We define *imbibition value* as the quantity of water, in parts per 100 parts of dry fiber, retained by the wet fiber after centrifuging a 0.5 g. sample for 5 min. at 1000 *g*. This value is a very close approximation of the amount of water taken up within the substance of the dry fiber when it is swelled to equilibrium on immersion in water.

The presence of cross-bonds stable to water is indicated by a marked reduction in the imbibition value.

TABLE I

Imbibition Values of Treated 150/27 Viscose Rayon

Treatment	*Imbibition Value* %
Untreated	90-100
Acid-formaldehyde	93-50
Borax	As untreated
Acetone-formaldehyde	40-45
Urea-formaldehyde	35-40
Melamine-formaldehyde	35-40
Glyoxal	40-45
Kaurit A1	45-50
Kaurit F1 (or WF)	45-50
Kaurit AF1	40-45

The results of an examination of a series of treated viscose rayons are given in Table I. The range of values recorded for any one treatment applies to modifications of textile interest. Thus lower, but non-typical, imbibition values can be obtained with acid-formaldehyde at the expense of embrittlement of the yarn, and higher values with treatments giving too little modification to be interesting.

The behavior of the borax-treated yarn probably illustrates the effect of breaking a cross-bond by the testing agent, in this case water.

(b) EFFECT OF SOLVENT AND SWELLING AGENTS.—During the swelling of a fiber in water, the crystallites persist unchanged, so that the basic fiber structure dependent on crystal forces limits imbibition. With reagents which are able to penetrate the crystallite and so cause unlimited swelling or dissolution of the untreated fiber, the presence of cross-bonds stable to the reagent may be expected to limit the swelling—i.e. cross-bonding will render insoluble an otherwise soluble material. With viscose rayon three reagents have been found to be especially useful—

Cuprammonium hydroxide (15 g. of Cu. + 200 g. of NH_3 per liter).

Sulfuric acid (63%).

Acetone (with the nitrated fiber)

In the first test a few threads of the fiber or fabric to be examined are shaken with 10 ml. of cuprammonium hydroxide for 5 hr. at room temperature; under these conditions the untreated fiber is completely soluble, while degrees of cross-bonding are shown in samples which may range from apparently unchanged to a highly swollen gel.

A viscose rayon fabric is parchmentized, almost losing its textile structure, when dipped in 63% sulfuric acid at 20°C. for 5 sec., aired for 5 sec., and then washed off in an excess of cold water. Cross-bonding is indicated by a diminution in, or absence of, parchmentizing action.

Viscose rayon may readily be nitrated in a mixture of nitric acid and phosphorus pentoxide *(6)* without loss of fiber structure. The nitrate is readily soluble in acetone unless cross-bonds cause insolubility. We have obtained highly nitrated celluloses (13.5% nitrate nitrogen), completely insoluble in and almost unswollen by acetone, by nitration of certain cross-bonded viscose rayons.

The results of three tests on a series of treated viscose rayons are given in Table II. It will be noted that in certain cases, as, for example, the action of 63% sulfuric acid and the nitration mixture on a urea-formaldehyde-treated and on an acid-formaldehyde-treated sample, the cross-bonds appear to be destroyed during the treatment with the reagent.

(c) CHANGE IN PHYSICAL PROPERTIES.—The introduction of cross-bonding leads to a profound change in the stress-strain relations of the fiber. Typical serimeter results for a series of treated viscose rayons are given in Table III.

Cross-bonding is indicated by a notable reduction in the extensibility of the yarn without considerable reduction in its strength. The change in properties is shown especially plainly in the stress-strain curves of the treated yarns, a selection of which is given in Fig. 2. It will be noted that in every case, save that of acetone-formaldehyde, the region of reversible elasticity is extended, and that in all cases plastic extensibility is diminished.

The extension of reversible elasticity to regions of higher stress can be demonstrated very strikingly by stress-strain curves drawn for increasing cyclic loadings, especially if the maximum stress in each cycle is maintained for a definite period. It is not possible to reproduce a selection of curves here, but the distinction in elastic properties between normal and cross-bonded filaments is very striking.

Chemical Nature of the Cross-bonds

One of the important logical steps in the demonstration of the real existence of cross-bonds is that in every case where the chemistry of the reaction is understood it has been possible to formulate the bond as a definite structure obeying valency rules and conforming to chemical principles. In particular, the structure formulated must represent a cross-bond capable of being formed in the conditions of the reaction and must represent the stability of the bond to a variety of splitting reagents.

In the course of our investigations we have been able to give satisfactory structural formulae for almost all systems, and notes on a selection of cases are given in the succeeding paragraphs—

For convenience the reacting hydroxyls in the cellulose polysaccharide chain are represented as—

$$\text{R-OH} \quad \text{or} \quad \begin{matrix}\text{R-OH}\\ \text{R-OH}\end{matrix}$$

The formulation II *below* on this system is identical with that already given for a methylene-ether bridge (I, p. 576). The group represented may be either a primary or a secondary hydroxyl group. Collateral evidence shows that the primary groups react not very much more rapidly than the secondary groups within a viscose rayon fiber, so that groups reacting successfully in the formation of a cross-bond are likely to be those determined largely by spatial relations or the intimate topochemistry of the structure.

(a) ACID-FORMALDEHYDE. — The bond may be produced by drying into a viscose rayon an acidified formaldehyde solution, followed by heating for a few minutes at 140°C.

The cross-bond produced is a methylene-ether bridge (II), as originally suggested by Meunier and Guyot *(1)*.

$$\text{R-OH} + \text{CH}_2\text{O} + \text{HO-R} \rightarrow \text{R-O-CH}_2\text{-O-R} + \text{H}_2\text{O}$$

(II)

The bond is stable to alkaline hydrolysis and moderately stable at *p*H 4.5 (100° C.), and is destroyed by strong acid hydrolysis and by nitration.

(b) BORAX.—The treatment consists in impregnating viscose rayon with a warm 20% solution of borax, followed by drying under conditions which minimize migration and surface crystallization of the solute.

The cross-bond formed (III) differs from the others described in this paper, since it is a coordination complex rather than a bridge containing only covalent links.

$$2\begin{matrix}\text{R-OH}\\ \text{R-OH}\end{matrix} + \text{Na}_2\text{B}_4\text{O}_7 + 2\begin{matrix}\text{HO-R}\\ \text{HO-R}\end{matrix} \rightarrow 2\left[\begin{matrix}\text{R-O}\\ \text{R-O}\end{matrix}\!\!>\!\text{B}\!<\!\!\begin{matrix}\text{O-R}\\ \text{O-R}\end{matrix}\right]^{-}\text{Na}^{+} + 2\text{H}_3\text{BO}_3 + \text{H}_2\text{O}$$

(III)

The bond energy of this structure is probably 10-20 kg.-cal., compared with about 100 kg.-cal. for a covalent bond, and about 7 kg.-cal. for a hydrogen bond between adjacent hydroxyl groups. Reference to the stress-strain curve in Fig. 2 suggests that the bond is stable up to a load of 1.2 g. per denier, but is disrupted at higher load values with a development of plastic extension very similar to that exhibited by untreated viscose rayon.

The bond is broken by water and all chemical treatments. Its existence is, however, demonstrated by the mechanical properties of the treated material, especially the very marked diminution of crease-resistance.

(c) ACETONE-FORMALDEHYDE. — This resin treatment is outstanding in that the reaction catalyst is an alkali—under these conditions a cross-bond of type (II) is precluded.

Viscose rayon is impregnated with a solution containing, say, 20% of an acetone-formaldehyde precondensate and 1% of sodium carbonate, and then dried and heated at 140°C. for 10 min.

The reaction scheme shown, leading to a formulation of the cross-bond (VI), may appear speculative, although each stage is possible under the conditions of the condensation. It has, however, been confirmed experimentally. Methyl vinyl ketone (IV) condenses with cellulose under alkaline conditions to give the *β*-acetylethyl ether, which shows no evidence of cross-bonding.

TABLE II

Effects of Reagents on a Treated Viscose Staple Fabric

S = Soluble I = Insoluble
P = Parchmentized NP = Not parchmentized

Treatment	*Cuprammonium Hydroxide*	*Sulfuric Acid (63%)*	*Nitrate in Acetone*
Untreated	S	P	S
Acid-formaldehyde	I	NP	S
Borax	S	P	S
Acetone-formaldehyde	I	NP	I
Urea-formaldehyde	I	Variable—P or NP	S
Melamine-formaldehyde	I	NP	I
Glyoxal	I	NP	I
Kaurit A1	I	NP	I
Kaurit F1 (or WF)	I	NP	S
Kaurit AF1	I	NP	I

TABLE III

Strengths and Extensibilities of Treated 150/27 Viscose Rayon at 65% R.H.

Treatment	*Strength (g./denier)*	*Extension at Breakage*
Untreated	1.8	21
Acid-formaldehyde	1.5	8
Borax	1.9	12
Acetone-formaldehyde	1.9	15
Urea-formaldehyde	2.2	9
Melamine-formaldehyde	1.7	10
Glyoxal	1.3	6
Kaurit A1	1.3	13
Kaurit F1 (or WF)	1.2	10
Kaurit AF1	1.3	6

This ether gives, on further reaction with added formaldehyde under alkaline conditions, a cross-bonded structure which can be formulated only as the ether (VI).

$$CH_3{\cdot}CO{\cdot}CH_3$$
$$+\ H_2CO \;\big|\; (+\ OH^-)$$
$$CH_3{\cdot}CO{\cdot}CH_2{\cdot}CH_2{\cdot}OH$$
$$\text{Heat} \;\big|\; (-H_2O)$$
$$CH_3{\cdot}CO{\cdot}CH{:}CH_2 \qquad \text{(IV)}$$
$$+\ HO{-}R \;\big|\; (+\ OH^-)$$
$$CH_3{\cdot}CO{\cdot}CH_2{\cdot}CH_2{\cdot}O{-}R \qquad \text{(V)}$$
$$(+\ OH^-) \;\big|\; CH_2O\ (-H_2O)$$
$$H_2C{:}CH{\cdot}CO{\cdot}CH_2{\cdot}CH_2{\cdot}O{-}R$$
$$+\ R{\cdot}OH \;\big|\; (+\ OH^-)$$
$$R{-}O{\cdot}CH_2{\cdot}CH_2{\cdot}CO{\cdot}CH_2{\cdot}CH_2{\cdot}O{-}R \qquad \text{(VI)}$$

It should be noted that attempts to make untreated viscose rayon react with alkaline formaldehyde do not yield a cross-bonded fiber. The above scheme of reaction is further supported by the observation that replacement of acetone by methyl ethyl ketone does not give a fiber showing cross-bonding, although it contains a large amount of resin, deposited interstitially.

The acetone-formaldehyde modification of viscose rayon, of the whole group of treated fibers here considered, contains the smallest proportion of the impregnant in the form of cross-bonds.

(d) UREA-FORMALDEHYDE. — The reaction of a urea-formaldehyde complex with viscose rayon, acid-catalyzed, is the basis of the well known anti-crease process. It is usual to start with a water-soluble precondensate of urea and formaldehyde sometimes described as "dimethylolurea". This material is a complex mixture of methylolureas and polymethylolureas which has a considerably greater solubility in water than pure dimethylolurea.

Differential stability of the cross-bonds in the treated rayon to hydrolytic agents shows that at least two categories of bond are present. One is very probably the methylene-ether bridge (II) formed by the condensation of part of the formaldehyde existing in the free form during the condensation at high temperatures, and the other in its simplest form is formulated as (VII). It is possible that bridges of a similar type and of identical stability are present, containing, however, additional urea and formaldehyde residues in the structure.

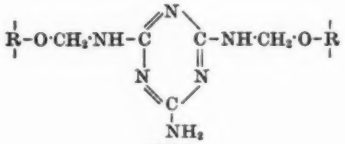
$$R{-}OH + HO{\cdot}CH_2{\cdot}NH{\cdot}CO{\cdot}NH{\cdot}CH_2{\cdot}OH + HO{-}R$$
$$(+\ H^+) \;\big|\; (-2H_2O)$$
$$R{-}O{\cdot}CH_2{\cdot}NH{\cdot}CO{\cdot}NH{\cdot}CH_2{\cdot}O{-}R$$
$$\text{(VII)}$$

It is to be expected that the cross-bond (VII) will be unstable to both acid and alkaline hydrolytic agents. It is destroyed by nitration.

An observation on certain urea-formaldehyde-modified viscose rayons provides direct rather than inferential evidence of the joining of cellulose molecules by chemical links. Extraction of the treated rayon with an acetate buffer (*p*H 4.6) at 100°C. removes the resin almost completely. In certain cases the extracted material is not soluble in cuprammonium hydroxide solution, but in other instances rayons have been obtained which are completely soluble but which have a lower fluidity than the untreated material. This can be interpreted as indicating that the mean molecular weight of the cellulose has increased as a result of the treatment, and that this increase is due to the union of two or more molecules to a larger unit by stable chemical cross-bonds.

(e) MELAMINE-FORMALDEHYDE.—The process is parallel to that described for urea-formaldehyde. The soluble precondensate in this case may be Kaurit AK2 (= Kaurit MKF) (IG), which is a tetramethylolmelamine.

Again two types of cross-bond are present—the methylene-ether bridge (II) and a cross-bond of the type whose simplest formulation is (VIII)—



(VIII)

The melamine-formaldehyde cross-bond is rather more stable to mild alkaline hydrolysis than the corresponding urea linkage (VII). Unlike the latter it is stable to nitration.

(f) GLYOXAL.—Glyoxal reacts readily with viscose cellulose when catalyzed by acid. Typically, viscose rayon is impregnated with a solution containing 3% of glyoxal and 0.4% of oxalic acid. After drying, the treatment is completed by heating at 140°C. for 5 min.

There is little doubt that the cross-bond is formed by a reaction analogous to that occurring with formaldehyde. The bond may be formulated as (IX), and it is possible that a small amount of structure (X) will be formed when a molecule of glyoxal reacts with four hydroxyl groups in a correct spatial disposition.

The existence of cross-bond (IX) is supported by the observation that treated viscose cellulose shows absorption of light in the near ultra-violet typical of an aldehyde or ketone grouping.

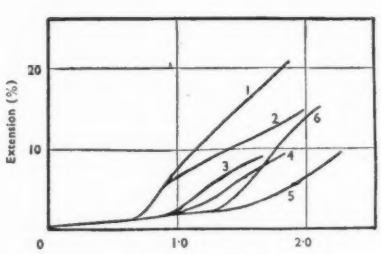
Stability of the glyoxal cross-bond to hydrolytic agents is similar to that of the formaldehyde bond. It is, however, stable to nitration.

$$R{-}O{\cdot}CH{\cdot}O{-}R$$
$$CHO$$
$$\text{(IX)}$$

$$R{-}O{\cdot}CH{\cdot}O{-}R$$
$$R{-}O{\cdot}CH{\cdot}O{-}R$$
$$\text{(X)}$$

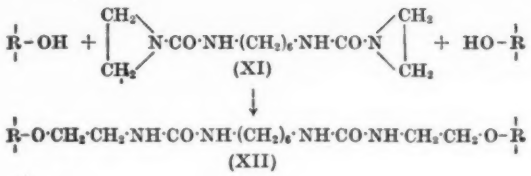
(g) ETHYLENEUREAS.—The I.G. Farbenindustrie have produced a number of products on an experimental scale which are derivatives of ethyleneurea (produced by the interaction of ethylene-imine and the corresponding *iso*cyanate). Several of these products are capable of reacting with cellulose to produce cross-bonds. Of these, the product known as Höchst 105, or Kaurit A1, has the structure (XI); impregnated into viscose rayon, it reacts without catalyst at comparatively low temperatures (100-120°C.) to yield a cross-bond of structure (XII).

In spite of the great length of the cross-bond, viz. eighteen atoms, imbibition is notably reduced. Although the bond is hydrolyzed by acids and alkalis, it possesses sufficient stability to make it of considerable technical interest.



1. Untreated
2. Acetone-Formaldehyde
3. Formaldehyde
4. Melamine-Formaldehyde
5. Urea-Formaldehyde
6. Borax

Fig. 2—Stress-Strain Curves for Treated 150/27 Viscose Rayon at 65% R.H.

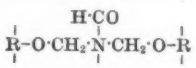


(XII)

(b) DIMETHYLOLLFORMAMIDE. — This compound (XIII), known also as Kaurit F1 or Kaurit WF, produces cross-bonding of viscose when condensed in the presence of an acid catalyst.

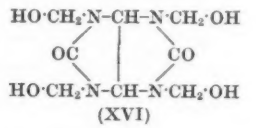
The cross-bond is in this case the methylene-ether link (I). The dimethylolformamide acts as a convenient reservoir of formaldehyde, its residue being attached to the cellulose at the end of the reaction as the formamidomethyl ether (XIV).

The cross-bond (XV) is probably not formed in any quantity. It may be expected to be rather unstable.

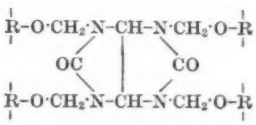


(XV)

(i) KAURIT AF 1—(XVI) is a compound produced by the reaction of formaldehyde with the condensation product of glyoxal and urea. It condenses with viscose rayon in the presence of an acid catalyst to give a cross-bonded product.



(XVI)



(XVII)

The molecule contains four reactive points, and is therefore able to react with four hydroxyl groups. Cross-bonding will occur when at least two hydroxyl groups of different cellulose molecules have reacted. Structure (XVII) represents the case when full reaction has occurred.

The methylene-ether link (II) is also formed, since some free formaldehyde is produced during the reaction from the decomposition of the methylol compound.

Stability of the Treatments to Washing

The stability of the various treatments to given reagents provides considerable information as to the structure of the interstitial resin as well as the nature of the cross-bond. Aqueous acids and alkalis are, in general, the most useful of the reagents, and of these the technically most important are hot washing liquors.

Results of washing typical treatments of viscose rayon by the procedure of the 1934 S.D.C. Standard Wash Test 3—0.5% soap and 0.2% sodt at 85°C. for 45 min.—are given in Table IV.

Two main points may be noted—(i) The very small amount of combined material necessary for the production of a strong cross-bonded effect (cf. acid-formaldehyde and glyoxal). (ii) The interstitial resin may be considerably removed without marked decrease of the amount of cross-bonding (cf. acetone-formaldehyde).

The table demonstrates also the considerable differences in resistance to washing of some of the treatments used in, or proposed for, the technical processing of viscose rayon.

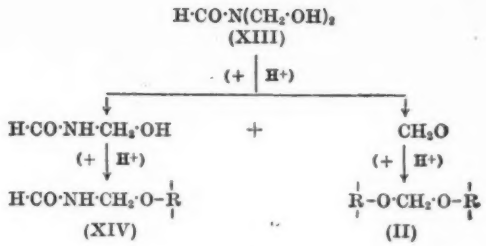
Extent of Cross-bonding

In certain instances it has been possible to make a rough estimate of the number of cross-bonds in a given modified viscose fiber.

Consideration of the glyoxal and formaldehyde treatments is important, since here the fiber is not loaded with interstitial resin. The results of Table IV show that, after washing to remove loosely adherent material, the amount of reagent required to produce notable cross-bonding is quite small.

Again, in certain instances it is possible to remove interstitial resin selectively by means of a suitable reagent, so that there remains a cross-bonded fiber with little or no loading. Examples of this procedure are urea-formaldehyde-modified viscose rayon extracted with hot weakly acid solutions, and Rayolanda (Courtaulds) treated with sodium hypochlorite solution and then extracted with hot dilute acid.

The proportion of residual cross-bonding material is very small in every case examined and the accuracy of the analysis is therefore low, but as a first approximation we believe that it is possible to generalize the results.



(XIII) (XIV) (II)

So far as agents such as formaldehyde and glyoxal are concerned, where the possibility of chelating or bridging two hydroxyl groups of the same cellulose chain is small, the reduction of the water imbibition and the proportion of cross-bonds are related—

1 cross-bond per 40 glucose residues—Imbibition value 35.

1 cross-bond per 100 glucose residues—Imbibition value 45-50.

These figures may be taken as a rough guide to the degree of cross-bonding of a treated fiber. It should be noted, however, that the apparent amount of cross-bonding determined analytically is greater than indicated *above* in the case of bridges of great length, as, for example, with Kaurit A1. Here, however, it is likely that the majority of the added material links two hydroxyl groups of the same cellulose molecule rather than of two different molecules.

With refinement of methods it may become possible to determine accurately the extent of cross-bonding in any particular modification of the viscose fiber, but until this happens the foregoing generalization will be found sufficiently accurate to be useful in many considerations of fiber behavior.

Technical Application of Cross-bonding Treatments

Very large quantities of viscose rayon staple, yarn, and fabric are processed technically by one or other of the processes discussed in this paper. The treatments currently proposed fall into four main groups—

Reduction of water retention.

Stabilization of dimensions

"Animalizing" (or imparting wool-like properties).

Crease-resisting.

(a) REDUCTION OF WATER RETENTION.—The object of the processes in this

TABLE IV

Stability of Treated Viscose Rayons to the 1934 S.D.C. Standard Wash Test 3

Treatment	*Imbibition*		*Added-Resin (%)**		*Proportion of Resin removed*
	Before	*After*	*Before*	*After*	
Acid-formaldehyde	35	37	1.5	0.5	66
Borax	90	90	20	0	100
Acetone-formaldehyde	42	49	18	7.3	60
Urea-formaldehyde	35	46	18	13	30
Melamine-formaldehyde	34	40	7.8	5.8	25
Glyoxal	45	50	0.5	0.3	40
Kaurit A1	45	47	7.5	4.8	36
Kaurit F1	45	54	17.5	8.0	55
Kaurit AF1	40	53	6.8	3.3	55

* "% Added Resin" is defined as the mass of reactant in grams combined with 100 g. of dry cellulose.

group is to reduce the amount of water absorbed by the fiber or fabric by means of a reduction in the imbibition value.

There seems to be no accepted generic name for this process, but in the United States the rather awkward terms "hydrophobize" and "hydrophobizing", corresponding to the German *hydrophobieren* and *Hydrophobierung*, are current.

The processes depend essentially on cross-bonding the fiber structure, and in no way on a surface water-repellency.

Treatments specially designated for this purpose include—

Wasch-Treu (Stockhausen)—Acid-formaldehyde.

Kaurit F1 (IG)—Dimethylolformamide.

Kaurit A1 (IG)—Ethyleneurea.

The advantages which are conferred on a treated viscose of this type are reduced wet weight, increased ease of drying, increased wet strength, and decreased wet extensibility, all points of considerable interest in the processing of rayon. Against these advantages must be set the lowering of the dry extensibility and consequent possibility of embrittlement of the fiber, and the marked lowering of the affinity for the usual cellulosic dyes. On account of this dyeing behavior it is usual to apply the treatment after piece-dyeing. For the best results selected dyes only should be used, for with many dyes there is considerable change in hue and some change in light-fastness.

In most commercial treatments in this group the imbibition value is reduced from 100 to 40-50.

(b) DIMENSIONAL STABILIZATION.—Dimensional stabilization of viscose rayon fabrics is an important technical problem, especially with certain fabrics containing spun viscose or viscose crepe yarn, since there may be difficulty in regaining the original dimensions after a normal laundering treatment (washing, drying, and ironing).

The reduction of water imbibition is helpful in the production of a dimensionally stable fabric, since lowered swelling and decreased plasticity when wet are obviously favorable factors. In general, therefore, stabilization treatments are similar to those of group *(a) above*, but differ in that they are applied only as fabric finishes and in so far as it is necessary to control the dimensions of the fabric at each stage of dyeing and finishing. In general each fabric has a restricted range of dimensions, depending on its construction, within which it is possible to stabilize the structure by means of the chemical finish.

Since the stabilization process depends on the modification of yarn properties conferred by the chemical treatment, it is essential that the latter should possess a maximum fastness to washing.

Among stabilization treatments which are in use or which have been proposed are—

Grafton (CPA)—Acid-Formaldehyde.

Sanforset (Cluett-Peabody) — Acid-Glyoxal.

Definized G (Alrose)—Acid-Glyoxal.

Acetone-Formaldehyde (ICI) — Alkali-catalyzed.

The application of these stabilized finishes poses a number of new problems in textile finishing. The chemical control of the conditions of application must be extremely accurate, especially when working with the acid-catalyzed processes, and simultaneously warp and weft dimensions must be maintained at predetermined values.

The difficulties of control have been overcome in practice, and bulk production is proceeding in several countries. The quantity of rayon textiles so treated shows a tendency to increase.

(c) "ANIMALIZING".—The object of "animalizing" or "basifying" viscose rayon is, in general, to produce a fiber or fabric which has some of the properties of wool or other protein fibers. Among these properties special attention has been directed to production of affinity for wool dyes, decrease in water retention, imparting a wool-like or other favorably modified handle, and improved recovery from creasing.

The treatments are applied to the textile material before dyeing, usually to the staple or yarn.

There are many suggestions in the literature on processes for animalizing, but of those which combine modified dyeing affinity with the other desirable properties mentioned *above* there have been proposed the following—

Phenol-Formaldehyde.

Guanidine-Formaldehyde.

Melamine-Formaldehyde.

Cyanamide-Formaldehyde.

Of yarns which have been produced on the bulk scale the German Artilana had a disappointing dyeing affinity, while Rayolanda (Courtaulds) has good all-round properties.

Vistralan, the basified fiber of the I.G. Farbenindustrie, does not belong to this group of cross-bonded materials—it is a viscose fiber into which are spun discrete particles of basic polyethyleneimine resin.

A successful chemical treatment in this group must meet stringent stability requirements—the resin must be reasonably fast to mildly alkaline scouring liquors and to the acid solutions employed in dyeing wool.

The reduction in water imbibition is an important feature of the treatment, but this must not be taken so far that the reduction in pore size of the water-swollen fiber structure is such that dye molecules cannot readily penetrate into the interior of the fiber.

Taking Rayolanda as a typical member of this group, it may be described as a resin-modified viscose staple with a good affinity for acid dyes and an imbibition value of approx. 50, which, when spun and woven, is capable of producing fabrics with a distinctive full handle.

(d) CREASE-RESISTING FINISHES.—The crease-resist process is based on the impregnation of the viscose rayon with either a urea-formaldehyde or a melamine-formaldehyde resin. The process is applied, in the presence of an acid catalyst, to the dyed fabric as a finishing treatment.

The modification of the fiber involves, as already indicated, an increase in elasticity and a decrease in plasticity, and this, in our opinion, is the basis of the crease recovery of the treated fabric.

In this country the urea-formaldehyde process is generally preferred, but in the U.S.A. there is a tendency to employ the melamine process since the latter has a greater stability (lower chlorine retention) than the former to the hypochlorite bleaches commonly applied there in the laundering of rayon fabrics.

The successful application of a crease-resisting finish to viscose fabrics requires a degree of chemical control which is typical of the whole range of chemical finishes discussed in this paper, but which is finer than has hitherto been usual in textile technology.

This point is best illustrated by a full technical description of the application of a urea-formaldehyde treatment to a spun rayon fabric. This may be useful, since there seems to be no adequate written description, although the patent literature *(7)* outlines the essentials of the process.

Technical Description of a Crease-resisting Process

The description given here refers to the processing of a batch of 10,000 yd. of Board of Trade Utility Quality 1018 (a spun viscose rayon fabric). Other qualities may require some modification of procedure, but only in matters of comparative detail.

(a) PREPARATION OF PRECONDENSATE OR DOPE.—The dope is prepared in a wooden tank (100 gal. capacity) provided with a mechanical paddle stirrer and a coil for steam heating and water cooling. The tank is fitted with a ventilating chimney and a tight-fitting wooden lid.

Seventy-nine gallons of commercial formalin is neutralized with caustic soda, cleared by heating to 60-70°C., and then cooled; 338 lb. of urea and 0.5 lb. of borax are added, and the whole is stirred until dissolved. This solution is *accurately* adjusted to *p*H 10.0-10.1 (glass-electrode measurements) by means of additions of caustic soda solution (72°Tw.), about 1-1.5 pints being generally required. It has been found that the use of an alcoholic solution of thymolphthalein is a suitable indicator for controlling the addition of the caustic soda. The solution is now heated to 60°C., and then immediately

cooled to 25-30°C. Heating and cooling are such that heating from 50° to 60° takes about 5 min. and cooling from 60° to 50° about 10 min. The further cooling should be complete in another 30 min.

The cooled precondensate is now a thin, clear syrup, and this is immediately diluted. If kept in the undiluted form it will, within 24 hr., set to a white paste which, on dissolving in water, gives a dope of inferior stability.

The precondensate batch is diluted with water containing 8.75 lb. of Brilliant Avirol (Gardinol) to a final volume of 243 gal. The specific gravity of this solution is 1.080.

(b) BOROTARTARIC ACID CATALYST.—The catalyst consists of 2.6 lb. of boric acid and 10.4 lb. of tartaric acid in water sufficient to make 7 gal. of solution (specific gravity 1.065), which is kept separately until required. The catalyst concentration in the dope as mixed for use is 0.525%.

The catalyst addition can be varied by an alteration in the concentration of the catalyst solution if it is desired to modify the state of condensation of the resin in the fiber.

(c) PREPARATION OF THE FABRIC.—It is essential to remove any starch size completely. The fabrics should be given a satisfactory enzyme treatment. They are then scoured at the boil for 60 min. in soap and caustic soda (addition of 1 lb. of each in 100 gal.), dyed by any normal method (using selected dyes suitable for crease-resist finishing), dried, and examined.

(d) IMPREGNATION.—The pad mangle is fitted with a small stainless-steel trough holding 18 pints of liquor, into which the dope from the mixing tank is run *via* a measuring tank which delivers 17.5 pints; immediately before replenishment of the trough 0.5 pint of catalyst solution is stirred into the delivery tank.

The expression at the pad is 90% (calculated on the conditioned weight of fabric). With 1018 quality one nip only is used.

(e) DRYING AND POLYMERIZING.—The speed of the mangle is automatically controlled to feed exactly at the speed of the drying range. The fabric, after leaving the nip, passes through the rollers of the automatic control, and then is passed, open and without creases, into the first drying zone, which consists of a four-passage vertical dryer. Here, four-fifths of the water is removed from the fabric. Next to the dryer is a 60-ft. tenter, passage through which removes the remainder of the water. This tenter is run at almost full width, i.e. 35.5 in. for a finished width of 36 in., and immediately on leaving it the fabric goes on to the polymerizer.

The fabric, running at 20 yd. per min., is baked for 2 min. in the polymerizer at 170°C. This polymerizer is a chamber heated by circulated air passing through a set of gas-fired heating tubes. Within the chamber 40 yd. of fabric is accommodated, passing over a series of driven rollers.

(f) WASHING.—The treated and baked fabrics are washed by a passage through an open-width washer, where they are treated with first a 0.05% caustic soda solution at 45°C., then hot water at 80°C., and finally a cold rinse containing a substantive cationic softener, e.g. Gemex Z6 (General Metallurgical & Chemical Co. Ltd.) or Sapamine KW (CAC), 1 lb. in 60 gal. The fabric is suction-extracted, plaited down, and tenter-dried with overfeed.

(g) TESTING.—The fabrics are examined for dyeing, uniformity, handle, appearance, etc. in the usual way, both after dyeing and after anti-creasing. Before physical and chemical tests are carried out, the samples for testing are conditioned for at least three, and preferably seven, days at 65% R.H. As a check on the anti-crease process itself, a crease-recovery test is carried out 12-24 hr. after polymerization, a value of over 70% recovery from crease in the case of 1018 quality being passed as satisfactory. (After three days' conditioning this becomes 85-90%.)

One fabric sample from every resin batch is tested fully.

(i) *Strength and Extension*—The fabrics are tested on the Schopper machine after conditioning at 65% R.H.

Typical results on quality 1018 are—

	Warp		*Weft*	
	Strength (lb./in.)	*Extension (%)*	*Strength (lb./in.)*	*Extension (%)*
Untreated ..	50	19	46	19
Treated	72	11	55	16

(ii) *Percentage Recovery from Creasing.*—After conditioning at 65% R.H. the treated fabrics are tested warp- and weftways by the customary method.

	Recovery %	
	Warp	*Weft*
After 24 hr.	70	70
After 3 days	89	90

(iii) *Resin Content of Treated Fabric.*—The resin content is determined by extraction of the resin by a 0.2M acetate buffer, *p*H 4.6, at 95-100°C. for 1 hr. It is computed thus—

$$\text{Added resin } (\%) = \frac{100\,(W_1 - W_2)}{W_2}$$

where W_1 = oven dry weight of treated fabric.

and W_2 = oven dry weight of extracted fabric.

On quality 1018 the added resin ranges 14-16%, substantially unchanged after five rayon washes (each 10 min. at 50°C. in 0.5% soap solution).

(iv) *pH of Extract.*—The extract in 40 vol. of boiled-out distilled water at 20°C. should have a *p*H value ranging 7.0-9.0, measured by a glass electrode.

(v) *Free Formaldehyde Content.*—The same extract as obtained in Test (iv) should show a free formaldehyde content of 0-20 parts per million. The fabric should be rejected if the extract contains more than 50 p.p.m. of free formaldehyde.

(vi) *Cuprammonium Solubility.* — A small amount of the treated fabric is pulled down into its constituent warp and weft threads and added to 10 c.c. of cuprammonium solution; the tube is stoppered and occasionally shaken. The treatment is satisfactory if the material is not dissolved in 5 hr. Solubility within 5 hr. indicates insufficient fixation of resin due to deficiency of catalyst or lack of rigor in the polymerizing conditions.

(vii) *Handle and Appearance.* — The treated fabric is compared with a standard fabric for handle and appearance.

(h) GENERAL CONTROL OF THE PROCESS.—In order to achieve a standardized finish on a given fabric it is necessary to pay close attention to the accurate preparation of the dope and catalyst solutions, and to the conditions of application and condensation of the resin. In particular, the handle of the fabric is very sensitive to the type of dope used and to the dimensions of the fabric at each stage of the treatment. It is possible to achieve reproducible results, but only by close attention to the details of the process, modifying the treatment as indicated by a consideration of the results of the test set out *above*.

Conclusions

It has been the purpose of this paper to show that desirable modification of the properties of viscose rayon can follow an application of a permanent chemical finish. With increasing knowledge of the chemistry and technology of these finishes, the standards of permanency are rising, and production of the desired modification is becoming more certain. It is, perhaps, not unduly optimistic to hope that, within the not too distant future, it will be possible to design a specific chemical finish to meet a specified requirement.

The authors desire to express their thanks to the Directors of Courtaulds Ltd. for permission to publish this paper.

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SURVEY OF COTTON IN THE NONWOVEN FABRICS INDUSTRY

THE infant nonwoven fabric industry now comprises thirteen major producing companies who almost without exception adapt either cards or garnetts for processing fibers into web structures, the National Cotton Council reports in a survey on "Cotton in Nonwoven Fabrics."

Differences in characteristics of the two types of webs directly influence their end use applications, the report says. In card webs, the fibers lie parallel and although the web has strength in only one direction a cloth-like fabric texture is produced. This is most desired in such items as draperies, napkins, tablecloths, and towels. In garnett webs, the more random distribution of fibers forms a web with balanced strength in all directions. Thus, garnett web fabrics serve best in uses where strength is paramount, such as fabrics for the coating trade and for plastic laminates.

Previously, the Council report says, companies manufacturing nonwoven fabrics either designed or adapted machinery for the production of webs. Now, however, two machinery manufacturers are developing equipment especially for nonwoven fabric production. One machine, which forms a random web, is reported to be adapted to the use of fibers from ⅛ inch to 2 inches in length. This machine is reported as ready for commercial use. However, non-woven fabric manufacturers apparently know very little about its advantages or limitations. A second machine, still in the experimental stage, is reported as embodying a design to lay the fibers parallel and at right angles in alternate layers to obtain equal strength in two directions and, it is said, would use lint cotton or staple rayon rather than waste materials.

The Cotton Council survey, which reports results of interviews with 30 manufacturers and suppliers of nonwoven fabrics, states nonwoven fabrics are made in weights ranging from one-half ounce to sixteen ounces per square yard. The three most widely used methods for bonding fibers together are: (a) Impregnating the web with a resin or other adhesive material; (b) Blending the thermoplastic fibers with cellulosic fibers and subjecting the web to pressure with a heated roll to soften the thermoplastic fibers which act as an adhesive binder; (c) Striping of the web with an adhesive which bonds the fibers together at regular intervals.

Nonwoven fabric manufacturers assert that the resin or adhesive content of the fabrics ranges between 5 and 25 per cent. In the case of fabrics made with thermoplastic fibers, content varies from 5 to 70 per cent.

In a section devoted to research opportunities for cotton in nonwoven fabrics, the Council report urges concentration on developing cotton nonwoven fabrics which can compete with paper and those which can enter entirely new markets in the borderline outlets between paper and woven materials.

Among the research problems which should be considered are:

STRENGTH.—The report reveals that in some cases nonwoven fabrics of rayon staple were slightly stronger than those of cotton. This additional strength is attributed to use of longer rayon staple fiber and to the fact that some bonding agents bind rayon staple fibers more effectively than they do cotton. "Research work should be directed toward increasing the strength of nonwoven fabrics through the development of better bonding agents designed specifically for use on cotton", the Council report says. "If such bonding agents can be developed, very short staple cotton might be used without impairing the strength of the finished materials."

LUSTER.—This quality, the Council survey shows, holds particular significance in decorative items and, for many such purposes, cotton lacks the necessary bright sheen. There is need for development, through research, of an inexpensive treatment to give cotton the desired luster. Since permanency is not of major concern, it is suggested that a surface treatment similar to that used to make glossy paper might serve for nonwoven cotton fabrics.

SPECKS.—The Council survey reports nonwoven fabric makers mentioned the presence of specks, lumps, and small shell fragments when cotton is used. These are most prevalent in colored and light weight cotton nonwovens. For example, draperies of nonwoven cotton fabrics show specks when sunlight shines through. In bags or wrappings for packaging use, the foreign matter also presents a problem since it may work loose from the fabric and fall into the contents of the container. Research projects for better cleaning and processing methods are indicated, the Council says, as a means of solution.

MILDEW RESISTANCE.—This is a prime consideration, the Council reports, in a number of uses such as seed bed covers and pipe wrappings. Consequently, research studies directed toward development of mildew resistance for cotton in woven and knitted fabrics should also cover nonwoven fabrics.

HARSHNESS.—"In a few uses," the Council report says, "such as industrial filters, the natural softness of nonwoven cotton fabrics may be a disadvantage. If some method for giving cotton materials more harshness could be found, through a chemical treatment which would not deteriorate during the filtering operation, or through use of special types of cotton lint or waste, cotton's position in nonwoven fabrics requiring harshness would be strengthened materially."

The Council report lists seven quality advantages enjoyed by cotton over competing materials in nonwoven fabrics. These are: (1) Softness (2) Adhesive qualities (3) Absorbency (4) Durability (5) Minimum amount of fuzz or line (6) Whiteness (7) Prestige.

Regarding cotton's softness, the Council points out that this is a most desirable quality for wear or application next to the skin. Moreover, softness is in demand in almost all disposables such as diapers and towels.

The adhesive qualities of cotton prove more satisfactory than those of any other materials, manufacturers report laminators as saying. Therefore stronger laminates can be produced with cotton. At the same time, coaters recognize the same superior adhesive qualities in cotton, and that better quality products come from using a cotton base.

Cotton's qualities of absorbency are considered important by nonwoven fabric makers. Cotton holds more liquid and also does not disintegrate or lose its body when wet. These are paramount considerations in items such as wiping cloths, towels, tablecloths, and similar nonwoven products.

Using cotton, the Council reports, lends longer use life to nonwoven fabrics. This, manufacturers say, is due to the higher fiber density within the nonwoven cottons. Such durability is especially necessary in all uses where the material is subject to abrasion, as for instance, in protective bags. Along with this advantage, the higher density of nonwoven cotton fabrics reduces infiltration of dust.

The fact that cotton nonwovens have less lint or fuzz than competing materials contributes to better appearance, the Council survey reports.

With respect to the quality of whiteness the Council survey says, "Since many types of nonwoven fabrics are produced from waste material, the fact is significant that manufacturers point out the superior whiteness of certain grades of cotton waste in comparison with competing wastes. Nonwoven fabric manufacturers reported that this quality advantage is noticeable and important."

Although prestige is an intangible and not of itself a quality characteristic, nevertheless it has been demonstrated that many non-woven fabrics are accepted simply because they are made of cotton. This is due, the Council report says, to observation and appreciation of cotton's superior qualities through years of experience with cotton products.

The Council survey makes it plain that nonwoven fabrics cannot compete on a quality basis with woven fabrics in most uses. The advantages held quality-wise by nonwoven fabrics over paper, in turn, are surpassed by the same qualities in woven fabrics. However, the specialized properties of nonwoven fabrics are highly significant in several uses.

In coated fabrics the effect of weave on appearance of the coating is eliminated since no weave exists in the nonwoven fabric to show through. Nor is there a ravelling problem when coated; nonwoven fabrics are cut.

In use as backing material for wallpaper, a surface smoother than woven fabrics eliminates the need for a filler. For casket linings, nonwoven materials, when used under satin, give a better tailored appearance than do woven fabrics.

Mechanical properties of plastic laminates are improved by nonwoven fabrics. The cut appearance is better too, because there are no coarse yarns or threads to show. Moreover, random web fabrics give strength in all directions, including diagonal strength. This is significant in uses such as gears.

In listing the multitude of possible uses for non-woven cotton fabrics, the Council report emphasized that the industry is still emerging from the experimental stage and that current statistics are not available to show total production of nonwoven fabrics in the United States. However, the following are some of the many potential market outlets: *Apparel*—aprons, bibs, costumes, diapers, graduation gowns, handkerchiefs, linings, shoulder pads. *Household*—bed spreads, dust clothes, doilies, napkins, pillowcases, hospital sheets, towels, window shades, lamp shades. *Industrial*—plastic laminates, acoustical curtains, bagging and wrapping fabrics, buffing wheels, cheese cloths, advertising specialties, holiday wrappings, ribbons, tapes, insulations, meat wrappers, tags, labels, twines, ropes, pennants, and banners.

• PATENT DIGEST •

PAUL WENGRAF

Printing Vat Dyestuffs By Fixation With Actinic Rays — D, 2, 01

Brit. P. 604,696
(Bleacher's Association, Farrington, et al., July 19, 1948)

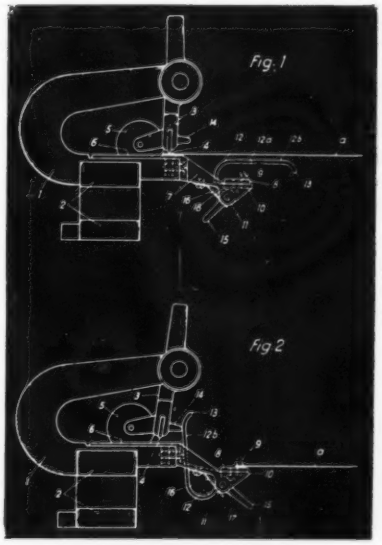
Certain substances such as gelatine, casein, shellac and some plastics are made insoluble by the action of light in the presence of a dichromate. This reaction is used in printing vat dyestuffs by applying the dye together with a solution of dichromate and gelatine or another binding agent becoming insoluble by the action of actinic light. This solution is padded on a fabric and dried—all the foregoing procedures being carried out in the absence of light. Subsequently, the dried fabric is exposed *in selected areas* to light and rinsed. The dyestuff—gelatine solution is removed thereafter from the non-hardened (non-affected) areas by treating the fabric with an appropriate washing agent or solvent while the vat dye is loosely held on the hardened areas and developed thereupon by alkaline reducing agents as usual. An example describes a modification of this process by working in two separate steps: 1. preparing a cotton fabric in amber light with a solution of ammonium-dichromate and gelatine, drying and 2. spraying it with the same solution containing Caledon Jade Green X. The prepared fabric is exposed under a negative to the rays of a Carbon arc lamp and washed in hot water. The vat dyestuff is reduced by padding in a sodium formaldehyde sulfoxylate solution in the presence of potash.

Reference is made to Brit. P. 597,982 (REPORTER 1949, 206). The fixation is effected here by conversion of ferric salts into ferrous salts.

Tenter Frame—Clips and Pins For Alternating Use — G, 3

Brit. P. 611,166
(Ph. Deck, Oct. 26, 1948)

Clip links as part of tenter frames have sometimes been combined with pin strips



Tenter Frame Clips—B. P. 611,166

on the same chain for optional use in one or another stretching devices. Obviously when the pin strips lie unprotected, the fabric, gripped by the clips, can come into unwanted contact with the fabric's selvedges; while in using the pin strips for tautening the cloth, the sharp edges of the clip may be damaged after some time because of the repeated vibrations. In that event the clips are soon worn out by falling back on the fixed plate. The present invention comprises a combined clip- pin-member, having the advantage of protecting and covering the non-operating part of the tautening device (the clips or pins respectively). In Fig. 1 of the drawing the clip member (1) is in action while the knife edge (4) holds the fabric (a) in a stretched condition during which the pin strip (8) with pins (9) is prevented from coming in touch with the fabric ,a) by a guard arm (12), bent at (12 b). A control member (15) is fixed to some part of the device, i.e., to lever (7). In turning this member (15) to the right (Fig. 2) the guard arm presses against projection (14), thus pulling the clip out of action while the pin strip (8) is brought at the same time in contact with the fabric (a). The arm (7) can be locked in both positions by the spring device (16).

Dyeing Apparatus for Vat Dyes—Reduction by Electric Current C, 6

Brit. P. 600,751

(Standard Bleaching & Printing Co., Carlton Hill, April 19, 1948)

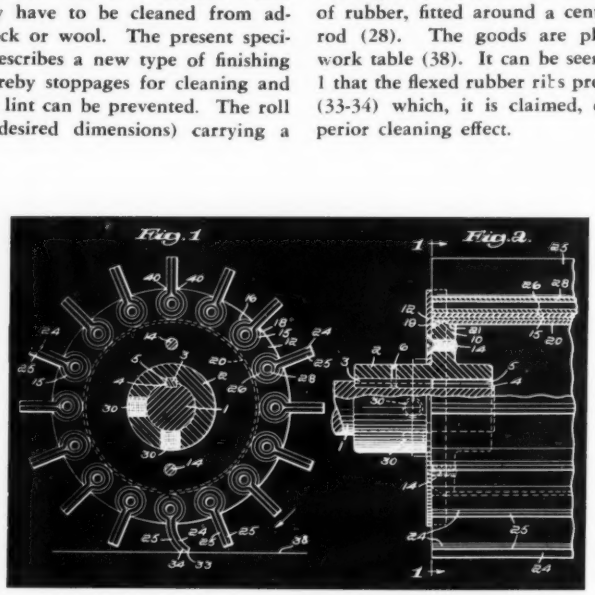
A vat dyeing process and apparatus are described wherein the vat is at least partially reduced in an alkaline bath, after which the cloth is impregnated with this dyebath and subjected to a direct electric current between an electropositive (iron) and an electronegative (nickel) electrode. The current has a voltage between 6-120 volts. The dyestuff solution contains suspending agents such as glue, gum, starch or the like. During the passage between the electrodes the wet fabric acts as an electrolyte and the electric current completes quickly the reduction of any unreduced dye to its reduced (vat) form. Penetration of the wetted material readily results and the impregnated cloth, leaving the electric zone, is re-oxidized in any known manner. According to the drawing enclosed here, the fabric is led through a relatively shallow vat (24) and between the rollers of a mangle. The bearings (17) are preferably non conductive electrically, while shaft (19) and rollers (22) and (30) are made from metals (i.e., from iron and nickel respectively). They are separated by a rubber roller 25). As illustrated, roller (22) is connected with the anode, and roller (30) with the cathode of an electric current. The re-oxidizing process is carried out as usual, followed by rinsing, soaping and drying.

Finishing Roll for Textiles—Brushing Device G, 3

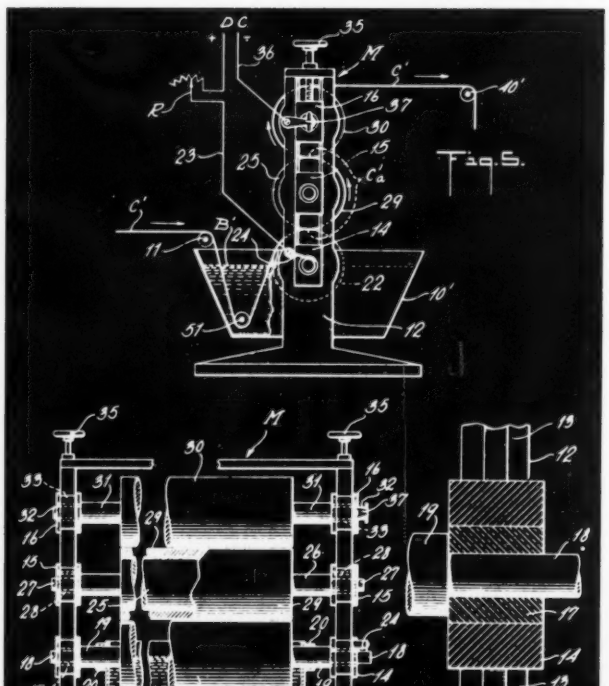
U. S. Pat. 2,466,348

(L. O. Nichols, Ambye, April 5, 1949)

The brushes known up to now for finishing textiles consist of bristles which frequently have to be cleaned from adherent flock or wool. The present specification describes a new type of finishing rolls whereby stoppages for cleaning and removing lint can be prevented. The roll (of any desired dimensions) carrying a number of yielding rubber fingers, consists of two discs (12) which are attached by screws (14-14). Tubes (15) are extending over the whole width of the roll, fixed in longitudinal slots (18). The rubber fingers (24, 25) are made from a strip of rubber, fitted around a center tube or rod (28). The goods are placed on a work table (38). It can be seen from Fig. 1 that the flexed rubber ribs present ridges (33-34) which, it is claimed, exert a superior cleaning effect.



Finishing Roll—U. S. P. 2,466,348



Dyeing Apparatus—B. P. 600,751

Shrinkproofing Wool—Sonic or Ultrasonic Waves A, 2, 04

U. S. Pat. 2,470,453

(Wolsey Ltd., Alexander, May 17, 1949)

Various methods for shrinkproofing wool have been suggested up to now comprising mostly chemical treatments such as fixation by alkylation of the interrupted -S - S - chains (U. S. Pat. 2,434,562, Textile Foundation: REPORTER 1948, 455), by treatments with hypochlorite or other halogen-yielding agents (U. S. Pat. 2,457,033, Harris Res. Lab.; REPORTER 1949, 326), with Permanganate (B. P. 586,020, Wolsey Ltd.; REPORTER 1947, 615), with Chlorosulfamates (U. S. Pat. 2,427,097, Kamlet et al.; REPORTER 1947, 788) and so on. The present invention describes a procedure quite different from standard shrinkproofing processes. It has been discovered that wool, either in form of loose fibers, yarns or fabrics, becomes substantially unshrinkable when exposed to the action of sonic or ultrasonic waves. These vibrations may be brought about by piezoelectric or electro-magnetic oscillators or by other different methods described in various scientific publications. The intensity of these vibrations, necessary for obtaining the aforementioned effect, is not quite exactly limited. A special test has been found in which vibrations, capable of coagulating a 0.1% egg-albumen-solution at the iso-electric point and at a temperature below 50° C., have to be applied in order to obtain shrinkproofness. It is understood that the only important factor is the intensity of the vibrations. Details regarding the optimal working conditions using this method are given: the apparatus consisting of a rectangular vessel holding water or another chemically indifferent liquor. The bottom of the vessel is formed by two quartz plates, which are subjected to electrical oscillations. The advantage of the present method is in an absolutely mechanical treatment; consequently any chemical change or damage of the fibrous substance is avoided.

References cited by the Patent Office, among others:

B. P. 587,214 (Am. Viscose) 1947: a dyebath is subjected to vibrations of high frequency, whereby an improved dyeing effect is said to result. This patent was discussed in REPORTER 1948, 104 (compare the references quoted there). It can be concluded that the influence of high frequency vibrations has the effect of dispersing dyestuffs while the physical structure of the fibers is influenced at the same time.

INDEX TO PATENT DIGEST

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U. S. Pat. 2,434,621 (United Merchants) 475 (1948)
U. S. Pat. 2,434,719 (Venango Eng. Co.) 475 (1948)
U. S. Pat. 2,435,591 (Ciba) 568 (1948)
U. S. Pat. 2,435,658 (Celanese) 537 (1948)
U. S. Pat. 2,435,891 (Amer. Viscose Corp.) 474 (1948)
U. S. Pat. 2,436,059 (Eastman Kodak) 474 (1948)
U. S. Pat. 2,436,076 (Cluett, Peabody) 473 (1948)
U. S. Pat. 2,436,156 (Du Pont) 538 (1948)
U. S. Pat. 2,437,554 (Durand & Huguenin) 475 (1948)
U. S. Pat. 2,437,965 (L. R. Bruce) 612 (1948)
U. S. Pat. 2,483,100 (Chemical Labor, Inc.) 631 (1948)
U. S. Pat. 2,438,328 (Fuller's Earth Union Ltd.) 630 (1948)
U. S. Pat. 2,438,738 (Trinity Holding Corp.) 631 (1948)
U. S. Pat. 2,438,781 (Boyle-Midway) 631 (1948)
U. S. Pat. 2,439,221 (Inst. of Paper Chemistry) 632 (1948)
U. S. Pat. 2,439,745 (Du Pont) 632 (1948)
U. S. Pat. 2,440,330 (Celanese) 655 (1948)
U. S. Pat. 2,440,648 (Uxbridge Worsted Co.) 767 (1948)
U. S. Pat. 2,441,085 (Du Pont) 768 (1948)
U. S. Pat. 2,441,859 (Alrose Chemical) 768 (1948)
U. S. Pat. 2,441,991 (Sherman Converse—Woodhead) 655 (1948)
U. S. Pat. 2,441,992 (Sherman Converse) 656 (1948)
U. S. Pat. 2,442,972 (Edelstein) 769 (1948)
U. S. Pat. 2,442,973 (Edelstein) 772 (1948)
U. S. Pat. 2,443,166 (Am. Cyanamid) 769 (1948)
U. S. Pat. 2,443,512 (Monsanto Chem. Co.) 107 (1949)
U. S. Pat. 2,443,782 (Pacific Mills) 107 (1949)
U. S. Pat. 2,444,124 (Am. Viscose Corp.) 107 (1949)
U. S. Pat. 2,445,064 (Tootal Broadhurst) 108 (1949)
U. S. Pat. 2,445,632 (Dow Chemical Co.) 108 (1949)
U. S. Pat. 2,446,502 (Wehrli) 108 (1949)
U. S. Pat. 2,446,682 (Chemical Laboratories Inc.) 109 (1949)
U. S. Pat. 2,446,992 (Geigy A. G.) 111 (1949)
U. S. Pat. 2,447,538 (Montclair Res. Corp.) 204 (1949)
U. S. Pat. 2,448,153 (Sec. of Agricult.) 205 (1949)
U. S. Pat. 2,448,247 (Cravenette Co.) 109 (1949)
U. S. Pat. 2,448,448 (Courtaulds, Ltd.) 110 (1949)
U. S. Pat. 2,448,515 (Dan River Mills) 110 (1949)
U. S. Pat. 2,448,892 (Eastman Kodak) 205 (1949)
U. S. Pat. 2,450,767 (Allied Chemical & Dye) 111 (1949)
U. S. Pat. 2,450,773 (Allied Chemical & Dye) 110 (1949)
U. S. Pat. 2,450,902 (Interchem. Corp.) 205 (1949)
U. S. Pat. 2,451,270 (Am. Cyanamid) 206 (1949)
U. S. Pat. 2,451,686 (W. A. Scholtens Chem. Fabr.) 295 (1949)
U. S. Pat. 2,452,339 (Uhlig) 477 (1949)
U. S. Pat. 2,453,752 (Stein, Hall & Co.) 325 (1949)
U. S. Pat. 2,454,078 (Du Pont) 326 (1949)
U. S. Pat. 2,454,623 (Geigy A. G.) 296 (1949)
U. S. Pat. 2,455,083 (Pacific Mills) 296 (1949)
U. S. Pat. 2,455,886 (Sayles Fin. Plants Inc.) 325 (1949)
U. S. Pat. 2,456,191 (Reichhold Chemicals) 363 (1949)
U. S. Pat. 2,456,301 (Un. Merch. & Manuf.) 424 (1949)
U. S. Pat. 2,456,471 (Durand & Huguenin) 296 (1949)
U. S. Pat. 2,457,033 (Harris Research Lab.) 326 (1949)
U. S. Pat. 2,458,397 (Courtaulds, Ltd.) 363 (1949)
U. S. Pat. 2,459,222 (Sec. of Agricult.) 477 (1949)
U. S. Pat. 2,460,777 (Gaylor—Warden) 477 (1949)
U. S. Pat. 2,460,875 (Celanese Corp.) 402 (1949)
U. S. Pat. 2,461,603 (Celanese Corp.) 476 (1949)
U. S. Pat. 2,462,108 (Stein, Hall & Co.) 478 (1949)
U. S. Pat. 2,464,342 (Pollak and Fasal) 478 (1949)
U. S. Pat. 2,462,428 (Ciba Limited) 424 (1949)
U. S. Pat. 2,464,453 (Unit. Merch. & Man.) 479 (1949)
U. S. Pat. 2,465,520 (Edelstein) 479 (1949)
Brit. Pat. 595,617 (Riverside and Dan River Cotton Mills) 698 (1948)
Brit. Pat. 591,496 (Monsanto Chem. Co.) 539 (1948)
Brit. Pat. 591,537 (Lockport Cotton Batting Co.) 539 (1948)
Brit. Pat. 591,708 and 591,712 (Brit. Celanese) 539 (1948)
Brit. Pat. 591,939 (Am. Cyanamid) 567 (1948)
Brit. Pat. 592,352 (British Thomson Houston) 567 (1948)
Brit. Pat. 592,484 (Am. Cyanamid) 656 (1948)
Brit. Pat. 592,649 (Cilander A. G.) 697 (1948)
Brit. Pat. 592,841 (Am. Cyanamid) 697 (1948)
Brit. Pat. 592,880 (Tootal Broadhurst) 697 (1948)
Brit. Pat. 593,315 (Lumsden & Mackenzie Ltd.) 697 (1948)
Brit. Pat. 595,344 (United Turkey Red Co.) 697 (1948)
Brit. Pat. 595,617 (Riverside and Dan River Cotton Mills) 698 (1948)
Brit. Pat. 595,959 (Brit. Celanese) 698 (1948)
Brit. Pat. 596,192 (Palestine Potash Ltd.) 698 (1948)
Brit. Pat. 596,281 (Imp. Chem. Ind.) 698 (1948)
Brit. Pat. 596,264 (Rhodiaceta) 702 (1948)
Brit. Pat. 596,525 (Macclesfield Engineering) 767 (1948)
Brit. Pat. 597,435 (Cranston Print Works) 206 (1949)
Brit. Pat. 597,733 (Brit. Celanese) 295 (1949)
Brit. Pat. 597,982 (Bleacher's Assoc.) 206 (1949)
Brit. Pat. 598,260 (S. A. Francolor) 295 (1949)
Brit. Pat. 602,050 (Fletcher) 478 (1949)
Swiss Pat. 244,321 (Heberlein) 538 (1948)
Swiss Pat. 246,968 (Heberlein) 538 (1948)
Swiss Pat. 247,429 (Durand—Huguenin) 538 (1948)

Proceedings of the
American Association of Textile Chemists and Colorists

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August 8, 1949

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CLEMSON COLLEGE
BRADFORD DURFEE TECHNICAL INSTITUTE

Report of Piedmont Section Outing

THE Summer Outing of the Piedmont Section was held July 24-25-26 at the Ocean Forest Hotel, Myrtle Beach, South Carolina, with 220 registered members.

A wide variety of entertainment included Swimming, Golf, Fishing, Tennis, and Shuffleboard. A special Bingo party was arranged for the Ladies on Saturday afternoon and Refreshments, Gifts and Musical surprises were in order.

Saturday evening at the banquet, an excellent dinner was served, business was disposed of promptly and thirty-four valuable door prizes were drawn.

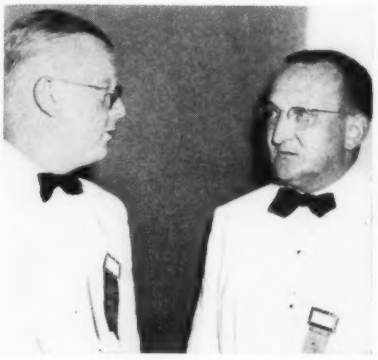
On both Friday and Saturday nights dancing was enjoyed at the Ocean Forest Hotel's Patio where, under the stars on the ocean front, a festive spirit prevailed.

Congratulations are in order to our outing chairman, W. Chester Cobb and to his committee, for an excellent meeting.

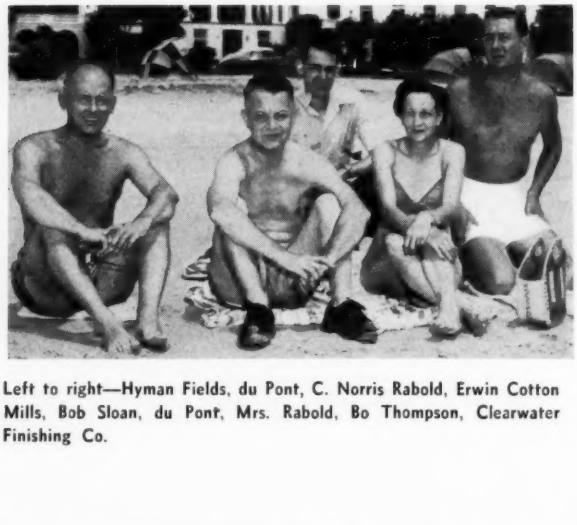
Respectfully submitted,

EDWIN A. BRIGGS,
Secretary.

Left to right—Chester Cobb, Arnold, Hoffman & Co., Graham McNair, F. H. Ross & Co., A. Henry Gaede, Laurel Soap, J. C. Whitt, Standard Hosiery, R. Burt McIntyre, Nopco Chemical, M. M. McCann, Warwick Chemical, P. E. Smith, Riegel Textile, Wyss Barker, National Aniline.



Left to right—P. E. Smith, Outing Chairman, Robert H. Smith, Incoming Chairman.



Left to right—Hyman Fields, du Pont, C. Norris Rabold, Erwin Cotton Mills, Bob Sloan, du Pont, Mrs. Rabold, Bo Thompson, Clearwater Finishing Co.

1st row, left to right—Mrs. Graham Fisher, Mrs. William Gaston, Mrs. A. H. Noble, Jr., Mrs. A. Henry Gaede, Mrs. P. E. Smith.

2nd row, left to right—Mrs. M. M. McCann, Mrs. Max Housch, Mrs. Ralph Marvin, Mrs. John Sutton, Mrs. John Neely.

Left to right—Mrs. W. R. Wands, Mrs. Dwight Turner, Mrs. A. H. Noble, Jr., Mrs. W. F. Gaston, Mrs. R. P. Anthony, Jr., Mrs. C. N. Rabold.

Left to right—Tom Gardner, Burlington Mills, Cramerton Division, A. H. Noble Jr., Arnold, Hoffman & Co., Jim Sandridge, du Pont, Bill Gaston, Burlington Mills, Cramerton Division.

Ladies Night, Western New England Section

Shown above is a portion of the group attending the meeting of the Western New England Section on May 20th at the Waverly Inn, Cheshire, Connecticut. Exhibits of consumer textile items manufactured in the area may be seen at the rear. A report of this meeting was published in the July 11th issue.

Meeting Dates, Northern New England Section

THE Northern New England Section announces the following meeting dates for the remainder of 1949:

September 16—Andover Country Club.

November 4—Lowell Textile Institute.

December 2—Boston (meeting place to be announced later).

Intersectional Contest Committee, Mid-West Section

BERTIL A. RYBERG, associated with the Textile Research Department of the Chemical Division, The Procter & Gamble Company, is Chairman of the Intersectional Contest Committee for the Mid-West Section.

Mr. Ryberg received his B.T.C. from Lowell Textile Institute in 1929, took special graduate courses at M.I.T. and received his M.S. from Lowell in 1936. He

Bertil A. Ryberg

is a member of Tau Epsilon Sigma, Textile Scholastic Society.

Prior to joining Procter & Gamble, Mr. Ryberg was Associate Director of Research for A.A.T.C.C. and made his headquarters at the Lowell laboratories. During his 14 years in this position he was directly concerned with a number of important projects including Evaluation of Detergents, Carbonizing, Separating Fibers in Mixtures, Damage in Wool, Light Fastness Standards and Water Repellency. He has a number of important publications to his credit.

Mr. Ryberg has served as Secretary of Committee L-14 of A.S.A. and has been a member of other A.S.A. and A.S.T.M. committees. He is a member of the A.A.T.C.C. General Research Committee and a mmeber of the research committees on Detergency, Standard Soils and Washfastness.

Other members of the Mid-West Contest Committee are:

Merrill G. Morris
Rock River Woolen Mills
Clarence G. Wille
Burson Knitting Company
Paul Soderdahl
Hart & Harrington, Inc.
William H. Shields
Emery Industries, Inc.
Joseph H. Jones
Phoenix Dye Works
John E. Schroder
General Dyestuff Corporation
Lawrence Locken
North Star Woolen Mills
Andrew F. Blackburn
Western Felt Company
William F. McNamara
Rockford Mitten and Hosiery Co.
Dr. Leonard J. Armstrong
Armour & Company

Gerhard R. Kremers, Strutwear Knitting Company, will be the judge representing the Section. The title of the paper to be presented by Mr. Ryberg at the Intersectional Contest in Atlantic City this October is "A New Approach to the Evaluation of Wool Oils for Resistance to Oxidation in Storage".

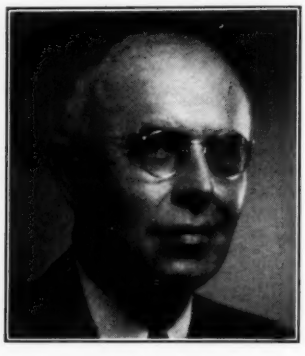
Chairman and Vice-Chairman for Atlantic City Convention

WALTER F. FANCOURT, 3RD, of W. F. Fancourt Co., Philadelphia, General Chairman for the Atlantic City Convention, October 13-15.

Mr. Fancourt is a Past Chairman and is at present a Councilor of the Philadelphia Section.

ERNEST E. RETTBERG, JR., of Scholler Bros., Inc., Philadelphia, Vice-Chairman for the 28th National A.A.T.C.C. Convention.

Mr. Rettberg was Publicity Chairman for the Philadelphia Section until he was appointed to the Convention post.



Charles B. Ordway

Intersectional Contest Committee, Piedmont Section

CHARLES B. ORDWAY, Burlington Mills Corporation, is Chairman of the Intersectional Contest Committee for the Piedmont Section.

Mr. Ordway received his B.S. and M.S. from Alabama Polytechnic Institute. After graduation he was with Du Pont in dyestuff technical application and demonstration work and also in sales and development work with Swann Chemical (now Monsanto). He was formerly in charge of the textile chemistry and dyeing department at Alabama Polytechnic Institute from 1930 to 1936. He was chemist and head dyer of Stonecutter Mills, 1936-38 and head of the technical department of the Southern office of American Aniline Products, Inc., 1938-46. Since 1946 he has been with the development department of Burlington doing research on dyeing and finishing.

Mr. Ordway helped to organize the Southeastern Section of A.A.T.C.C. and served as secretary and chairman, 1932-34.

Other members of Mr. Ordway's committee are:

S. H. Williams
General Dyestuff Corporation
R. A. Bruce
Amalgamated Chemical Corporation
H. J. Jordan, Jr.
Wiscassett Mills
James N. Grant
Calco Chemical Division, American Cyanamid Company
Clarence Hooper
Burlington Mills
Dr. H. Y. Jennings
Dan River Company
Linton C. Reynolds
Riegel Manufacturing Co.
Joe Lindsay, Jr.
Clemson College
V. B. Holland
Cannon Mills

The judge representing the section will be Wyss L. Barker, National Aniline Division, Allied Chemical & Dye Corp. The title of the paper to be presented by Mr. Lindsay at the Intersectional Contest in Atlantic City this October is "Dyeing Mixed Acetate and Viscose Fabrics with Vat Dyes".

EMPLOYMENT REGISTER

This column is open for four insertions per year, per member, without charge. Blanks can be obtained from, and filed with, the Secretary of the Association, Lowell Textile Institute, Lowell, Mass. It is understood that these will be open to inspection by prospective employers, who can obtain further information from the Secretary.

49-16

Education: Chemist.

Experience: Dyer, hosiery.

Age 54; married; references. Southern U. S. preferred.

6-27, 7-11, 7-25, 8-8

49-17

Education: New Bedford Textile Institute.

Experience: 16 years chemist, dyer and head dyer, cotton and rayon.

Age 40; married; references. Eastern U. S. preferred.

6-27, 7-11, 7-25, 8-8

49-18

Education: B.S., Mass. Inst. of Tech.; further courses elsewhere.

Experience: Textile chemical, laundry and garment analysis, including executive and sales service work.

Age 41; married; references; now located in middle west.

6-27, 7-11, 7-25, 8-8

49-1

Education: B.T.C., Lowell Textile Institute.

Experience: Laboratory technician, cost research, quality control, following army service.

Age 26; married, references.

7-11, 7-25, 8-8, 8-22

49-19

Education: B.S., Texas Tech. College, Chem. & Dye.

Experience: Cotton finishing.

Age 31; married; references; Southwest preferred.

7-11, 7-25, 8-8, 8-22

49-20

Education: B.S. in Textile Chemistry.

Experience: Textile Chemist and Colorist.

Age 32; married; references; New England preferred.

7-11, 7-25, 8-8, 8-22

49-21

Education: Graduate, textile technology, New York State Inst. of Applied Arts & Sciences, classs valedictorian.

Experience: summer work during education.

Age 23; unmarried; will go anywhere.

7-11, 7-25, 8-8, 8-22

CALENDAR

SOUTH CENTRAL SECTION
Outing: September 9 to 11 (Lookout Mountain Hotel, Chattanooga).

PHILADELPHIA SECTION
Meetings: September 16, November 11 (Kugler's, Philadelphia).

PIEDMONT SECTION
Meeting: November 5 (Charlotte Hotel, Charlotte, N. C.

HUDSON-MOHAWK SECTION
Meetings: September 16, November 18.

NEW YORK SECTION
Meetings: September 23, November 18 (Swiss Chalet, Rochelle Park, N. J.)

NORTHERN NEW ENGLAND SECTION
Meetings: September 16 (Andover Country Club), November 4 (Lowell Textile Institute), December 2 (Boston).

COUNCIL
Meetings: September 9 (The Warwick, New York), December 9 (New Yorker, New York).

RESEARCH COMMITTEE
Meetings: Sept. 9, Dec. 9.

NATIONAL CONVENTIONS
1949: October 13 to 15, Chalfonte-Haddon Hall, Atlantic City.
1950: September 28 to 30, Portsmouth, N. H.
1951: October 18 to 20, Statler, New York.
1952: Boston.

Research Highlights

DETERGENCY.—The Committee on Wool Detergency (A.A.T.C.C.) has developer a laboratory detergency comparator which after much check work is recommended as a standard tool for evaluating detergents in wool fabric manufacturing processes. Making the comparator available to industry will become the task of the Merchandising Committee.

ABSTRACTS

Some Observations on the Levelling Properties of Acid Dyes

D. R. Lemin and I. D. Rattee, Journal of the Society of Dyers and Colourists, page 217, Vol. 65, No. 5, May, 1949.

The rates of dyeing of a large number of level-dyeing acid dyes, measured under specific conditions, tend to decrease with increasing basicity of the dye. The reverse is found to be the case with regard to the relative boiling-off properties of acid dyes. With regard to the production of level dyeings, the latter property is of greater importance in view of the general rapidity of uptake of the level-dyeing acid dyes by wool.

The effect of pH on the exhaustion of a number of acid dyes has been examined, and the pH-exhaustion curves have been found to follow the shape of the acid titration curves of wool. The sensitivity of the dye exhaustion to pH has been found to increase with the basicity of the dye. A study of the effect of dye remaining in the dyebath after dyeing on the rate of levelling has been made with Naphthalene Red JS and Naphthalene Scarlet 4RS,, and a hyperbolic relationship has been found to exist between the time of half-dyeing and the concentration of dye anions in the dyebath. It is shown that good levelling can be promoted only at the expense of exhaustion, and that the safest way in which this can be obtained is by an increase in anion concentration by addition of Glauber's salt or a similar source of anions rather than a decrease in the amount of acid, thereby raising the dyebath pH.

Some Observations on the Levelling Properties of Acid Dyes

II—Prechromed Dyes

D. R. Lemin and I. D. Rattee, Journal of the Society of Dyer sand Colourists, page 221, Vol. 65, No. 5, May, 1949.

The exhaustion of three selected prechromed dyes at different dyebath pH values has been measured, and the results show marked differences from those obtained with level-dyeing acid dyes under similar conditions. It is shown that the leveling properties of this type of dye increase with decrease in the dyebath pH. The boiling-off properties of the dyes examined have been shown to be better in the presence of sulfuric acid than hydrochloric acid at the same final dyebath pH.

The Mechanism of Diazotization and of Nitrozation

H. H. Hodgson and W. H. H. Norris, Journal of the Society of Dyers and Colourists, page 226, Vol. 65, No. 5, May, 1949.

The essential mechanism of diazotization and of nitrozation, which is the mode by which either two nitrogen atoms or a nitrogen and carbon atom are linked together as the case may be, is interpreted as that of a generalized aldol condensation. This takes place between undissociated nitrous acid and the free aromatic amine or a phenol or a secondary or tertiary amine. The role of an acid, if present, is to facilitate elimination of water and, in the case of diazotization, to convert the nitrosoamine, initially formed, into the corresponding diazonium salt.

Addition of Cellulose Glycollic Acid to Detergents

C. Viertel, Melliand Textilber, 1947, 28, 345-348; through the Journal of the Society of Dyers and Colourists.

Compared with soap, synthetic detergents are usually deficient in suspending power. It is therefore advantageous to include a suspending agent with the diluents which are to be used in making washing preparations from such detergents. The influence of additions of 0.5-1.0% of cellulose glycollic acid (Tylose HBR) on a washing powder containing detergent, soda, sodium sulfate, and sodium silicate was investigated. The Tylose dissolved completely in hot water, but formed flocks when an attempt was made to dissolve it in cold water. In a test of foaming power the addition of Tylose was found to increase the amount of lather formed, but the effect was appreciable only at high temperatures. Suspending power was measured by adding various types of soiling matter to wash liquors. The coefficient of reflection of pieces of cotton fabric was measured before and after treatment in these liquors. With all types of soiling matter the results showed that Tylose addition did exert a suspending action on the dirt. The effect was confirmed with natural soiling in tests on control fabrics which were included with loads of towels in a domestic-type wash. Control pieces were also included in runs of practical laundry washes. Tests on these pieces showed that addition of 0.66% of sodium cellulose glycollate (2% of Tylose HBR) increased the degree of whiteness obtained, had no influence on tensile strength, reduced the ash content, and had a favorable influence on other properties, such as the handle and appearance of the fabric.

Annual General Meeting

Journal of the Society of Dyers and Colourists, page 205, Vol. 65, No. 5, May, 1949.

A report of the 65th annual general meeting of the Society of Dyers and Colourists which was held on March 25, 1949. Among the items of interest were the following:

During 1948 the Society had a net increase of 250 members. Attendance at sectional meetings had increased. The Bradford Dyers' Association Ltd. had provided a sum of £2000, the income from which is to be used for the provision of the George Douglas Lecture. An improvement in the paper situation will enable certain sections of the *Journal* to be printed in larger type. Steady progress on the work of compiling the new *Colour Index* was reported as were cordial relations with the A.A.T.C.C. in this respect.

The final version of the second report of the fastness tests committee should be issued within a few months. The second report of the committee on dyeing properties of direct cotton dyes has been published. A general plan for publishing a review of textile progress in 1950, in conjunction with the Textile Institute, is well in hand.

The 64th annual dinner was held on March 19th at which time the Worshipful Company of Dyers' Medals were presented to Dr. T. Vickerstaff and Dr. H. Phillips, the Diploma of Honorary Membership of the Society to H. Jennison, and Gold Medals to F. Scholefield and Fred Smith.

A summer school, suggested by the Midlands Section, was implemented by the Manchester Section and the school was run in conjunction with the Manchester Regional Council for Further Education and the Manchester College of Technology. About 100 persons attended the school for 1 week and it was declared an outstanding success.

G. E. Holden was reelected president of the society; A. W. Dudbridge, J. G. Evans, G. G. Hopkinson and F. Scholefield were elected vice-presidents; T. A. Forster, B. Kramrisch, Fred Smith and G. S. J. White were elected ordinary members of the council; H. Jennison was reelected honorary treasurer and J. Barritt honorary secretary.

Protective Action of Certain Vat Dyes Against the Influence of Light

J. Miller, Melliand Textilber., 1947, 28, 353-358, 389-393; through the Journal of the Society of Dyers and Colourists.

Certain vat dyes, notably Indanthrene Olive Green B, exert a protective action against the degradative influence of light on admixed yellow dyes in combination shades and on the fiber itself. In order to obtain information on the number of dyes which exhibit this phenomenon a large number of green compound shades were tested, and a detailed description of their fading behavior is given. Indanthrene Olive Green B and the related dye Indanthrene Marine Blue B have an outstanding protective action; other blue and green dyes have a similar action but are themselves destroyed to various extents in the process. A collection of data shows that the light fastness of the mixture is less than the average light fastness of the components. From tables of strength losses due to exposure of dyeings in self shades a range of vat dyes is classified into groups according to their influence on fiber damage. Indanthrene Olive Green B has an outstanding protective action, while a number of blue dyes have a similar but less pronounced action. The effect of mixtures of active and protective dyes was investigated. It was found that the protective dye neutralizes and may outweigh the effect of the active dye to an extent which depends on the relative concentrations.

Chemically Modified Wool

W. Kirst, Melliand Textilber., 1947, 28, 394-396; through Journal of the Society of Dyers and Colourists.

The methods suggested by both Speakman and Harris for increasing the stability of wool by formation of new cross-links after reduction of the disulfide bonds are reviewed. The use of *s*-dichloroacetone and 1:3-bischloromethyl-4:6-dimethylbenzene as cross-linking agents in the Harris method was investigated. The decrease in alkali solubility obtained with these reagents was of the same order as that obtained with dibromoethane. Wool treated with dichloroacetone became brown on treatment with alkali, but that treated with 1:3-bischloromethyl-4:6-dimethylbenzene retained a good color. The first stage of Speakman's method of cross-linking with metal salts was modified by reducing the disulfide bonds with calcium thioglycollate instead of sodium bisulfite. Figures are given for the alkali solubility of wools reduced in this manner and then aftertreated with copper, barium, zinc and nickel salts. The solubilities are less than that of the reduced wool but greater than that of the original untreated material. The zinc salt, however, gave a product which did not show any yellowing when treated with hot alkali, and this effect was considered to be of technical interest. It was found that the same result was obtained in a one-bath treatment in which thioglycollic acid and zinc sulfate were applied together. The zinc salts could be replaced by stannic, thorium, and cerium salts.

Protective Action of Sodium Pyrophosphate when Dyeing in the Presence of Iron

P. Rabe, Melliand Textilber., 1947, 28, 352-353; through the Journal of the Society of Dyers and Colourists.

The reaction of sodium pyrophosphate with iron salts is described. Iron-sensitive acid and chrome dyes were applied in the presence of iron with addition of various phosphates. Sodium metaphosphate, hexametaphosphate, pyrophosphate, and acid pyrophosphate, the three sodium orthophosphates, sodium ammonium phosphate, and diammonium hydrogen phosphate were used. The acid pyrophosphate was undoubtedly the most effective protective agent. Its action is very well demonstrated with the classical example of Acid Alizarine Red G. An addition of pyrophosphate is therefore recommended when the water used for dyeing contains iron. Rusty machines can be cleaned with a 0.5% solution of pyrophosphate, when any further tendency to rusting is reduced. Addition of pyrophosphate will also eliminate the effects of iron in the application of basic dyes and certain direct dyes and in the diazotizing of developed dyes. The stability of certain diazotized bases which are sensitive to iron, in particular Fast Red ITR Base, is greatly improved by addition of pyrophosphate.

Dyehouse Economics

Irving Teplitz, Textile Age, page 7, Vol. 13, No. 7, July, 149.

The most important consideration of economical dyehouse operation is the cost and production of steam. Where other conditions are equal, however, the cost of labor is the deciding factor. Water costs are less important than steam costs but are particularly important to plants with a dye beck installation. Where dyeing costs and prices are low, the high transportation costs of fabrics existing today may be more important than any other factor but where dyeing costs are high, transportation costs are of minor consideration. A large plant can effect considerable savings in other transportation costs by bulk purchases of chemicals and dyestuffs.

George Douglas, His Times, and Some Thoughts on the Future

Herbert Livinstein, Journal of the Society of Dyers and Colourists, page 269, Vol. 65, No. 6, June, 1949.

This is the first George Douglas lecture and is a review of the dyeing and dyestuff manufacturing advances made during the lifetime of George Douglas.

Progress in Bleaching Practice

R. G. Fargher, Journal of the Society of Dyers and Colourists, page 276, Vol. 65, No. 6, June, 1949.

This article compares progress in bleaching practices in England with those of the United States and countries on the continent.

The Raising of Dyed Fabrics

C. B. Stevens, C. S. Whewell and H. T. Yegenaga, Journal of the Society of Dyers and Colourists, page 280, Vol. 65, No. 6, June, 1949.

Patterns of woven wool fabrics dyed with various types of dye and of the undyed material are raised together both wet and dry, and the thickness of each raised pattern is measured. The results indicate that in general cloth dyed with Neolan dyes is raised more readily than undyed cloth, but when dyed with acid milling dyes, neutral-dyeing acid, dyes, direct cotton dyes, mordant dyes, or indigo the susceptibility of the cloth to raising is reduced. Application of equalizing acid dyes produces little change in raising characteristics. While recognizing considerable variations among individual dyes from each group, it is significant that, except in the case of indigo dyeing, the lower the final pH of the dyebath, the more easily can dyed fabric be raised. The changes following dyeing are most marked when the cloth is raised wet.

Dye Resist Process for Nylon

Du Pont Technical Bulletin, page 50, Vol. 5, No. 2, June, 1949.

An early method for resisting silk to acid dyes was the exhaustion of tannic acid on to the silk fiber and subsequent laking with tartar emetic and/or stannous chloride. This process stains the fiber and cannot be used for white effects but it is satisfactory for colored effect threads. Investigation revealed that this method was applicable to nylon but with the same limitation. A new procedure for resisting nylon to cross dyeing in acid baths has been developed. The tannic acid process was improved by substantially eliminating dissolved iron from the treating liquor and shortening considerably the time of treat-

ment with tannic acid, tartar emetic and tin crystals, respectively. The resist treatment consists of the following steps:

(1) Dissolved iron is precipitated from the treating liquor with pyrophosphate.

(2) The nylon yarn is entered into the bath and tannic and acetic acids are added. The temperature is raised to 200°F. and maintained for 30 minutes.

(3) Tartar emetic is added to the bath and treatment of the nylon is continued for 20 minutes at 200°F.

(4) Stannous chloride is added to the bath and treatment continued at 200°F. for another 10 minutes. The yarn is then rinsed and dried.

Both undyed and dyed nylon were treated by this process and also by the regular tannic acid resist process. The various treated nylon yarns were compared for resistance to cross dyeing with several acid, direct and chrome colors.

The conclusions follow:

Bright nylon yarn, either undyed or dyed with acid or direct colors, has been successfully resisted for use as an effect thread in woolen and worsted fabrics. Sour dyeing acid, chrome and direct colors generally stain the material less than the neutral dyeing types. Good whites are not produced when the material is cross dyed with a heavy chrome navy or black.

Considerable experimental detail on materials and dyeing methods and on the iron-free tannic acid resist are given.

Resisting of Effect Threads for Vat-Dyed Cotton Half-Hose

Du Pont Technical Bulletin, page 67, Vol. 5, No. 2, June, 1949.

Attention has been given to the resisting of nylon to staining by vat dyes, so that it may serve as an effect thread.

Nylon yarns dyed with acid, chrome or vat dyes may be resisted sufficiently so that they can be used as colored effect threads in men's vat-dyed cotton half-hose dyed with selected dyes in all popular shades except navy. The resist treatment is carried out by working the dyed nylon yarn for one hour at 190-200°F. with 10% Du Pont Mordant BS and 10% acetic acid (28%), based on the weight of the fiber. Du Pont Mordant BS stains undyed nylon an ecru shade and dulls dyed nylon slightly. However, the suppression of staining by the dyes more than compensates for this fault.

Both filament and spun nylon yarns of various counts were treated, both before and after dyeing with acid, chrome and vat colors, with Du Pont Mordant BS and DP. The various resisted yarns were tested in cross dyeings with the complete range of vat colors both singly and in combination.

There is considerable experimental data.

A Comparison of Common Salt vs. Glauber's Salt for Evaluating Fast-to-Light Direct Colors

Du Pont Technical Bulletin, page 79, Vol. 5, No. 2, June, 1949.

To determine the difference in rate of exhaust and ultimate strength of dyeings on cotton and rayon, 15% common salt and 30% Glauber's salt were applied to both fibers and the effects compared.

Most of the Glauber's salt dyeings showed less exhaust than the common salt dyeings after 5 minutes but after 60 minutes the differences were usually negligible. The colors varied widely in their exhaust rates and also in the amount of dye remainaing in the bath after 60 minutes.

Experimental details are given.

The Thermosol* Process for the Coloration of Fiber V**, Orlon† Acrylic Fiber and Nylon

Du Pont Technical Bulletin, page 82, Vol. 5, No. 2, June, 1949.

The Thermosol Process is a relatively simple method for dyeing and printing Fiber V, Orlon and nylon. It consists of applying a selected dye solution or dispersion to the synthetic fiber, usually by padding or printing, then drying and heating to a relatively high temperature for a short time. Under these conditions the color appears to dissolve in the fiber, producing a dyeing which is fast to washing and crocking. The temperature of fixation depends on the fiber and the dye being applied, but usually lies in the range of 360°F. to 480°F. with contact times of 5 to 60 seconds. The optimum conditions for a particular color and fiber must be determined by laboratory experiment. After heating, the fabric is soaped to remove any unfixed surface color.

Considerable data is given on experimental work in the application of this method. It is stated that the information is being published at this time, even though much of it is in the development stage, with the hope that it will stimulate additional laboratory experimentation by textile finishers. It is emphasized that the information is to be used only as a basis for development work by the individual mill and is not to be used as a basis for full scale mill runs. The researach program is continuing.

* The Name Thermosol is a temporary designation for the "heat-soluble" process, and will soon be superseded by a more descriptive term.

** Fiber V is an experimental fiber being produced by Du Pont.

† Orlon is the Du Pont trade-mark to designate its acrylic fiber.

Fade-Ometer—

(Concluded from Page 574)

control device, but this is a rather complicated arrangement not easily adapted to the present Fade-Ometer. One possibility is, of course, to place the instrument in a room of constant humidity, which is generally available at textile testing laboratories. However, the lamp will act as a local source of heat and may thus disturb the condition in the rest of the room.

Incidentally, it may be mentioned that some regulation can be obtained also with wet wicks if they are arranged as in Fig. 10. The wicks are hanging on the rotating system and revolve with that. They dip into the waterbath and the air is forced through them. Then the humidification is more effective than when the air passes only above them. By changing the number of layers the degree of humidification can be regulated to some extent. However, the increase of moisture content is not more than about 2-3 gm./kg. dry air, and consequently the system can be used to compensate only relatively small changes in the surrounding air. As it must be managed by hand, it is difficult to keep the humidity constant when the conditions of the surrounding air often change.

Summary

The temperature in the Fade-Ometer has been measured by means of thermocouples connected to a recording potentiometer. The values found were rather high compared with those likely to be met in practice and at the very surface of the samples the temperature could sometimes exceed 100°C. The temperature of the air just in front of the samples was about 55°C. At this temperature a very large amount of water is required to get a high relative humidity. In the present Fade-Ometer, model FDA-R, the relative humidity is only about 10% and it is shown that it depends more on the humidity of the testing room than on the humidifier. By forcing all the cooling air in front of the samples, the temperature can be lowered and the relative humidity raised.

Acknowledgment

The emissivity for constantan could not be found in common handbooks. The value given in this paper was estimated by courtesy of Professor E. Rudberg, Institute for Metal Research, Stockholm. The author's thanks are also due to the head of the Swedish Institute for Textile Research, Professor N. Gralén, for helpful discussions.

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TRADE NOTES • NEW PRODUCTS

ICI Standard Observer for Colorimetry*

Recent work at the National Bureau of Standards indicates that the "ICI standard observer," that is, the fundamental data on color mixture that has since 1931 been accepted internationally for interpreting colorimetric measurements, may need to be revised.[1] This work corroborates findings from three other laboratories in this country, Harvard Medical School, Eastman Kodak Company, and National Lead Company.

Modern colorimetry depends upon a break-down into its component spectral parts of the light entering the eye of the observer. The spectral transmittance of standard filters and the spectral reflectance of opaque color standards are measured by means of the spectrophotometer. Since its recommendation in 1931 by the International Commission on Illumination, the standard way of interpreting such spectrophotometric information has been by way of the body of fundamental data on color mixture known as the 1931 ICI standard observer. These data have achieved world-wide acceptance for this purpose, and in the United States particularly the ICI standard observer has found its way into hundreds of practical applications.

Considerable interest was therefore aroused by a report from the Titanium Division of the National Lead Company that the ICI standard observer was not adaptable to the colorimetry of titanium-pigment paints[2]. A. E. Jacobsen found that, when the well-known near-white anatase and rutile titanium dioxide pigments were incorporated in a paint vehicle, they yielded colors that could be distinguished by eye. However, spectrophotometric data reduced by means of the ICI standard observer indicated that the colors were the same. He suggested that the ICI standard observer weighs too lightly the spectral region below 430 mu.

As the first step in a study of the phenomenon by Dr. Deane B. Judd of the Bureau's photometry and colorimetry laboratory, a pair of these titanium-pigment paints was examined by 7 observers. Four of the seven corroborated Jacobsen's conclusion; three agreed closely with the standard observer. A modification of the standard observer was then derived, based upon the spectral luminosity determinations of Gibson and Tyndall at the National Bureau of Standards and of Wald at the Harvard Medical School. The modified observer was shown to account largely for the observations of the group of 4 observers that disagreed with the standard observer. Since this work, the Gibson-Tyndall-Wald data on spectral luminosity have had striking corroboration by Weaver of Eastman Kodak; his results likewise indicate the standard luminosity function to be too low in the short-wave extreme of the spectrum.

It is recommended that further studies of the luminosity function in this region be conducted, particularly by foreign laboratories, so that a broad and sound basis for a possible revision of the ICI standard observer may be laid. Until such time as a revision is made officially by an international body, however, the National Bureau of Standards will continue to base its color standards on the 1931 ICI standard observer.

* Technical Report 1360, National Bureau of Standards.

1. For further technical details, see "A comparison of direct colorimetry of titanium pigments with their indirect colorimetry based on spectrophotometry and a standard observer," by Deane B. Judd, which will appear in the September 1949 issue of the NBS Journal of Research.

2. A. E. Jacobsen, "Non-adaptability of the ICI system to some near-whites which show absorption in the far-blue region of the spectrum," J. Opt. Soc. Am. *38*, 442 (1948).

• Cullen Retires

Robert E. Cullen, director of acetate sales in the Du Pont Company's Rayon Department, has retired after more than 34 years in the Du Pont organization. Mr. Cullen was appointed director of acetate sales on April 1, 1935, and was transferred to Wilmington in that capacity on June 1, 1937.

A native of Williamsport, Md., Mr. Cullen was born on April 1, 1886. He attended public school at Williamsport and Hagerstown, Md. In 1907 he was graduated from Lehigh University with a degree in civil engineering.

Secretary of Agriculture Brannon, left, presenting to Mr. Goldthwait the Superior Service Award for outstanding research on the dyeing characteristics of cotton leading to the development and application by industry of the differential dye test for cotton maturity.

• Goldthwait Wins USDA Award

Outstanding research on a differential dye test for cotton maturity has won for Charles F. Goldthwait, Cotton Technologist at the Southern Regional Research Laboratory in New Orleans, a Department of Agriculture Superior Service Award.

Mr. Goldthwait received the award from Secretary Brannon at the annual Honor Awards Ceremony held in Washington on May 16. He was one of a small group of scientists recognized in 1949 for noteworthy achievement under the Department's system, inaugurated a few years ago, of honoring its employees for contributions of extraordinary significance.

The research for which Mr. Goldthwait was honored began several years ago, when a cotton mill requested the Southern Laboratory to assist it in solving a problem in connection with the uneven dyeing of certain types of cotton fabrics. In assisting this one mill, Mr. Goldthwait developed a technique which now is used in many of the leading cotton mills of the country, not only as an aid in the prevention of uneven dyeing but also as a means of channeling cottons of different maturities into the end-products for which they are best suited.

It is known that immature or underdeveloped cottons result in neppy fabrics which dye unevenly. Mr. Goldthwait, proceeding on the theory that the segregation of immature cottons at the mill would lessen these problems, developed a selective dyeing test which quickly determines the maturity of the cotton.

Cotton fibers are immersed in a dye bath containing two entirely different dyes,

one with an affinity for mature or fully developed fibers, and the other with an affinity for the immature fibers. Mature cotton comes out of this bath red, while the immature fibers dye green.

This differential dye test has already proved so useful that Mr. Goldthwait is now working to develop it into a quantitative method for measuring cotton maturity, to further simplify the procedure, and to extend its application.

• 1950 Spring Colors for Men's Felt Hat Bodies

Six new shades are portrayed in the 1950 Spring Card for Men's Felt Hat Bodies, recently issued by The Textile Color Card Association to its members.

These spring hat colors include *Hemptone,* a neutral cord or twine shade, *Clipper Grey,* a medium slate version, *Seahaze,* a misty tone half green and half blue, and *Fieldbrown,* a subdued medium shade. Also featured in this new collection are two distinctive pastel tones of considerable style interest, namely, *Chalkgrey,* a light pearl grey, and *White Sand,* a pale natural shade.

In creating these men's hat tones, it was explained, the Association gave careful consideration to their close coordination with important advance color trends in men's suits and topcoats for the coming spring and summer seasons.

The committee which assisted the Association in the selection of the above colors represents leading firms in the men's hat industry.

• Made Director of Sales

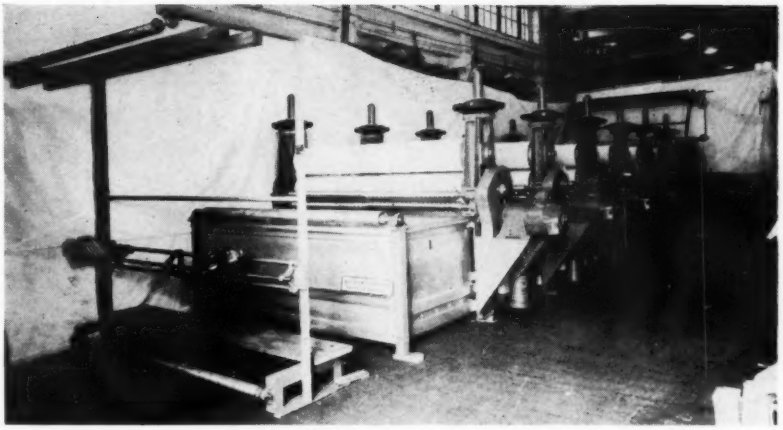
George S. Demme, assistant director of nylon sales for the last five years, has been made director of sales of the Acetate Division of the Du Pont Company's Rayon Department, it was announced recently. Mr. Demme succeeds Robert E. Cullen, who retires after more than 34 years in the Du Pont organization.

• Thouron Transferred

Henry A. Thouron, assistant director of sales of the Synthetics Department of Hercules Powder Company since 1947, joined the Export Department August 1, the company announced.

Late in September he will transfer to Holland as special assistant to C. M. Rutteman, director of N. V. Hercules Powder Company, in The Hague. He will cover sales of Hercules products in western Europe.

Before going to Holland, he will spend some time in the Wilmington offices of the Cellulose Products Department and the Naval Stores Department, to learn about recent product developments.



Birch Bros. 7-Tank Open Width Machine

• Birch Open Width Machine

Birch Bros., Inc., of Somerville, Massachusetts announce another 7 Tank Open Width Machine of stainless steel construction with roller bearing squeze rolls to which pressure is applied by Foxboro air motors, except on the last tank which is equipped with air cylinders to give a 30,000 pound squeeze. The drive is by individual D. C. gear motors controlled by rheostats actuated by built-in dancer roll compensators to give accurate tension control. The entering end of the machine is fitted with cloth guiders and the delivery end with both a folder and rolling-up arrangement.

This particular machine was built for the new plant of a leading mill for scouring and crabbing rayons, rayon blends, worsteds, tropicals, serges and gabardines. Such a machine is particularly essential for the uniform finishing of gabardines. Further information will be supplied upon request.

• Conklin Appointed

Joseph E. Conklin has been appointed Sales Representative for Antara Products, General Aniline & Film Corporation, 444 Madison Avenue, New York 22, New York, manufacturers of detergents, wetting agents, emulsifiers, dispersants, and carbonyl iron powders.

Mr. Conklin, who was formerly with Francis I. du Pont & Co. as a registered representative, will handle sales of Chat, new liquid detergent for machine dishwashing.

• German and Soviet Developments in Organic Chemistry

Translations of 84 German and Russian reports dealing with hydrocarbons and various hydrocarbon derivatives have been published by Research Information Service, 509 Fifth Avenue, New York 17, N. Y., and are listed in their latest bulletin No. 36, entitled *"Organic Chemicals."*

The Reports listed include a large number of previously unpublished I. G. Farben patent applications, descriptions of industrial operations, and manufacturing processes as well as many articles from scientific journals of the USSR of recent date.

All the RIS Reports are listed by title, author, Publication Board Number and most of them carry a summary of the information presented therein. The bulletin is available on request.

• New Mortar and Pestle

A new "synthetic sapphire" mortar and pestle for use in pulverizing samples of very hard substances is said to be far superior to ceramic and steel mortars for this purpose. It will permit grinding of beryl, Carborundum and similarly hard substances with hardness ratings below that of tungsten carbide.

The new mortar, made of pure aluminum oxide, has a smooth, dull finish surface and is impervious to moisture. It cannot flake off to contaminate a sample nor is it magnetic (will not attract lint, dust, etc.). Working area of mortar is 62 mm. in diameter and 24 mm. deep. The pestle is 70 mm. long. Fisher Scientific Company, 717 Forbes Street, Pittsburgh 19, Penna.

Fisher Mortar and Pestle

H. H. Pact

• Pact New Manager

Harry H. Pact has recently been appointed manager of the Textile Chemicals Department, Oil and Chemicals Division, E. F. Drew and Co., Inc., Boonton, New Jersey.

This appointment marks the growing emphasis on the development of new products and sales to the textile industry by the Drew organization. Mr. Pact has had wide experience in serving the technical and production requirements of the leading textile processors and chemical manufacturing companies. He was formerly the Field Supervisor of Textile Chemical Sales of the Drew Company.

• U. S. Testing Adds to Staff

As a result of the rapid acceptance by industry of new services offered by the United States Testing Company with main laboratories in Hoboken, N. J., several new employees have been added to the company's staff.

Among the recent additions are Frederick L. Fish, Michael Powsner and Edward H. Winkleman. Powsner, a graduate of Cooper Union Institute of Technology and New York University Graduate School came to the Testing Company from the Research and Development Branch, Office of the Quartermaster General, Washington, D. C., where he gained wide experience in the development of specifications and testing of all types of building and construction materials. He is presently working as an assistant supervisor in the recently formed Engineering Inspection Division of the Company.

Winkleman, who has had special training in the field of ultrasonics, is assigned to the service division of the company. Formerly with Morrison-Knudsen Afghanistan and the Rockefeller Center Corporation he is presently working with research clients in the development of ultrasonic solutions to industrial problems.

Fish, a graduate of Rensselaer Polytechnic Institute with a degree in Chemical Engineering, was formerly with the Masonite Corporation and the New York State Government. With wide experience in the plastics field, he is assigned as a service representative assisting plastics firms in the development of testing and research programs utilizing the company's new plastics laboratory.

• New Equipment

One of the leading textile finishing operators in the South has just placed an order with the John Waldron Corporation, New Brunswick, New Jersey, for a new "Heliofast" printing line with "Varistroke" doctor motion. This equipment is expected to be placed in service about the end of the year, and will afford this textile finishing operator what is believed to be the most modern, enclosed drive, high speed printer in the industry.

• Statistics Released

The United States Tariff Commission has released preliminary statistics on United States production and sales of surface-active agents. This release, the eighth in a series giving preliminary statistics on 1948 production and sales of synthetic organic chemicals, shows production and sales of synthetic organic detergents, wetting agents, and emulsifying agents.

United States production in 1948 of surface-active agents as a group amounted to 366 million pounds, or 26 percent more than the 291 million pounds previously reported for 1947. Sales in 1948 totaled 267 million pounds, valued at 86 million dollars, and were somewhat greater both in quantity and value than they were in 1947. Production in 1948 of all sulfated and sulfonated (ion-active) chemicals in this group totaled 319 million pounds; sales were 226 million pounds, valued at 68 million dollars. In volume of production in 1948 the principal items in this group were benzenoid compounds (101 million pounds), aliphatic and aromatic petroleum sulfonates (57 million pounds), and oils, fats, and waxes (35 million pounds).

Production in 1948 of all polyhydric alcohol ethers and esters (generally nonionic chemicals), totaled 26 million pounds or about 7 percent of the total output of all surface-active agents. Production in 1948 of nonsulfonated nitrogen-containing compounds (chiefly cation-active chemicals) totaled 19 million pounds, or about 5 percent of the total output of all surface-active agents.

The preliminary statistics on total production and sales of surface-active agents being issued today are about 95 percent complete. The complete statistics will be given in the Commission's final report, which will be issued later.

Copies of the section on surface-active agents may be obtained by writing to the United States Tariff Commission, Washington 25, D. C.

Jack L. Craig

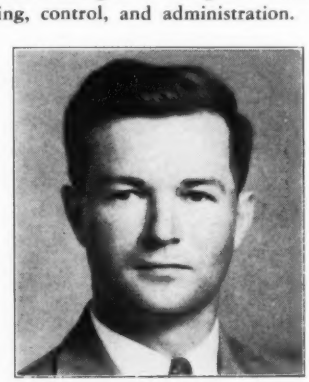
• Joins Wyandotte

Jack L. Craig recently joined Wyandotte Chemicals Development Department as a Technical Field Representative. He will specialize in the promotion of benzene sulfone derivatives, aromatic acids and chloroether type compounds. Following chemical engineering graduate work at University of Colorado, Mr. Craig spent the two years previous to his Wyandotte Chemicals association with DuPont's Fabrics and Finishes Department.

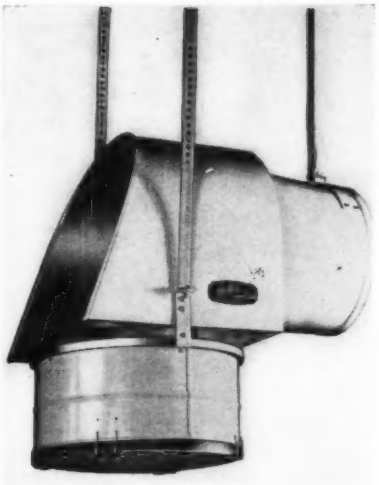
• Tribble New Sales Manager

Interchemical Corporation—Textile Colors Division, Fair Lawn, N. J., announces the appointment of Feaster V. Tribble as Southern District Sales Manager for Aridye Pigment colors and Clears, with headquarters in Rock Hill, S. C. Mr. Tribble joined the Textile Colors Division as a technical representative in 1947. Previously he had been associated with Southern Bleachery & Print Works, with Tidewater Associated Oil Co., and with W. D. Dodenhoff Co., Inc. Mr. Tribble was graduated from Clemson College, where he majored in textile chemistry. He is a member of the American Association of Textile Chemists & Colorists.

Clovis S. Powell continues as Southern District Manager in charge of manufacturing, control, and administration.



Feaster V. Tribble



Model 30 Walton Humidifier

• New Humidifier

The addition of a new model to their industrial line of Walton Humidifiers was announced by the Walton Laboratories, Irvington 11, N. J.

To be known as the Model 30, this unit evaporates approximately three gallons of water per hour. Electrical consumption is approximately 230 watts, and, as with other Walton equipment, all that is needed is connection to a city water supply and electric current.

Elimination of compressors, expensive air or drain piping, and duct work, is an important feautre of Walton equipment. Model 30 units may be used in multiple to provide uniform, controlled humidity conditions in an enclosure, or are suitable for "spot" humidification, or for boosting the humidity obtainable from existing systems of any type.

Complete and absolute diffusion of moisture with room air is said to be obtainable with the Model 30, as well as with the many other models of Walton Industrial Humidifiers. Further specifications and technical information on the Model 30, and the other Walton Industrial or Domestic Humidifiers may be obtained by writing directly to Walton Laboratories.

• Hooker Appointment

The Hooker Electrochemical Company announces the appointment of Allen L. Spafford as field salesman in the territory comprising upper New York State and western Pennsylvania. Mr. Spafford has been associated with Hooker for two years as a process study engineer. He is a graduate of Cornell University with B. S. and B. Chem. E. degrees and is a member of The American Institute of Chemical Engineers.

Mr. Spafford's headquarters will be the Niagara Falls office of the Hooker Company.

• Dr. Nelson Retires

Dr. Thomas Nelson, dean-emeritus of the School of Textiles at N. C. State College and one of the nation's pioneer educators in the field of textiles, has retired from his duties at the college after approximately 48 years of service, Dean Malcolm E. Campbell announced.

A native of Preston, England, Dr. Nelson joined the N. C. State faculty in 1901 and began to develop the College's School of Textiles, which is now the world's largest institution of its kind.

Dr. Nelson, an internationally-known textile technologist and educator, retired as dean of the School of Textiles in September, 1943, but has continued to serve on the faculty as professor of designing since that time.

In announcing Dr. Nelson's retirement, Dean Campbell said that "Dean Nelson's interest in all things relating to the improvement of the industry, together with his kindly personality and interest in young textile students over a period of half a century, have won friends for him all over the world."

He praised Dr. Nelson particularly as the builder of the School of Textiles and as a recognized authority on fabric design and manufacture.

N. C. State, in common with other Southern schools, had little to offer in the way of textile education when young Nelson joined the faculty. The textile department, with a couple of machines, was tucked in a basement. It had only one instructor and taught only carding and spinning.

The school now has one of the most modern plants in the world and is currently constructing an addition to its building, nearly doubling the floor space and facilities. It graduated a total of 275 students on June 12—nearly one-third of the nation's crop of 900 textile graduates.

Dr. Nelson was born on April 24, 1872, and attended the Preston, England, Technical School. He was awarded a certificate for weaving and designing in 1891 by the City of Guilds of London and later worked in some of the finest fancy weaving mills in England.

After coming to the United States, he worked in mills in Connecticut and Massachusetts, and was assistant superintendent of a small mill in Petersburg, Va. He taught warp preparation and weaving in the Lowell, Mass., Textile Institute for a year, and then came to N. C. State.

In 1906, he became professor of textiles and head of the textile department. In 1924, when the Board of Trustees created the School of Textiles, Dr. Nelson became its first dean. Two years later, the college conferred upon him the honorary degree of Doctor of Science in recognition of his 25 years of service with the college. He was elected first president of the newly-formed National Council of Textile Deans in the spring of 1943.

In 1907, Dr. Nelson's first book, "Weaving: Plain and Fancy," was published. A few years later his second book, "Practical Loom Fixing," made its appearance. This book which is now in its fifth edition, has an international circulation and is used as a textbook in several textile schools. He has also written numerous articles pertaining to the textile industry for the leading textile publications.

In 1908, Dr. Nelson helped organize and was a charter member of the Southern Textile Association. Since that time five of his former students have served as president of this association.

During his long tenure at State College, students came to him from many states and nations. He is known in textile circles from India to England and in the largest and smallest North Carolina mills. The industry and the Federal government have enlisted his services many times on special problems on which his expert advice was sought.

In addition to advancing the State College School of Textiles to a position of international prominence and importance, he has served as a commercial agent for the Bureau of Manufacturers of the U. S. Department of Commerce and Labor, as special agent for the U. S. Tariff Board, and as a consultant with the Tariff Commission.

He has frequently been called to appraise mill properties, aid in untangling textile problems encountered by various manufacturing plants and to advise on the purchase of mill machinery.

Dr. Nelson resides at 16 Enterprise Street, Raleigh.

• Hilton-Davis B-Naphthol

Hilton-Davis, Cincinnati, has now made its first batch of colors using its own Beta-Naphthol produced in the newly completed $1,500,000 plant on the factory site on Langdon Farm Road, James F. Thompson, vice-president of Sterling Drug Inc., in charge of the division, announced.

Mechanical difficulties, necessitating modification of equipment, developed during test runs that started last April, Mr. Thompson said. They are being gradually eliminated, however, and the plant should be in full production by October.

First of the colors made with this plant-manufactured important intermediate was 5-45F100 Resinated Barium Red Lake C. Mr. Thompson said that under tests it was found to be "superior to regular market standards."

As part of a plant expansion program, seeking to make the Hilton-Davis operation as self-contained as possible, the division has been making its own naphthols, fast bases and stable salts for the past six months.

• New Standards List

More than 140 new American Standards, approved since January of this year, are included in the midyear list of standards and special publications just issued by the American Standards Association, 70 E. 45th St., New York 17, N. Y. The list shows a total of 1124 standard specifications, methods of test, building requirements, dimensions, safety codes, definitions and terminology in all fields of engineering as well as for materials and equipment used by the ultimate consumer.

All of these have been given the status "American Standard" through the procedure of the Association which assures all groups concerned an opportunity to have a voice in their development.

Important new standards listed for the first time include a series on chemicals used in photographic processing, soap specifications, lamp dimensions and electrical characteristics, textiles, electrical indicating instruments, and building code requirements on signs and outdoor display structures. There are also two new American Standards in the series on small tools and machine tool elements and a recently completed American Standard Plumbing Code.

Special publications offered include "What Good Are Standards," a handbook of practical answers assembled from the proceedings of the Thirtieth Annual Meeting of the Association, and "Democracy in Action," the story of the development of the Association. It also includes a report on "Nationally Recognized Standards in State Laws and Local Ordinances," issued in an attempt to find an answer to the problem of how nationally recognized standards can legally be put into effect and kept up to date.

The new list offers a complete set of all American Standards at $250 and a complete set of all American Safety Standards at $37.50.

The 28-page List of American Standards (July 1949) can be obtained from the American Standards Association.

• Rohm & Haas Rocket Research

A contract to organize and operate a laboratory for basic research and development in rockets and jet propulsion has been signed with the Ordnance Department of the U. S. Army by Rohm & Haas Company of Philadelphia, chemicals manufacturers, according to Otto Haas, president. The project will be located at the Army's Redstone Arsenal near Huntsville, Alabama, one of the large arsenals constructed during the last war.

"The company is undertaking this project as a public service," said Mr. Haas. "We have no intention of entering into the manufacture of propellants.

"We were asked by the Ordnance Department to enter into this contract because we have within our organization a number of men whose wartime experience fits them to assume key positions in the technical organization required for this project. Foremost in this group is Dr. Ralph Connor, vice president in charge of research, who during the war served as Sectional Chief and later Chief of Division 8 of the National Defense Research Committee attached to the Office of Scientific Research and Development and who received the government's Medal of Merit for his services to the Armed Forces."

• Join Evans Staff

Hugh Pickering, B.Ch.E., who was graduated from New York University, class of 1949, has joined the staff of Evans Research and Development Corporation as a research assistant in the physical chemistry research section. Mr. Pickering interrupted his education to become a First Lieutenant in the U. S. Marine Corps as a pilot in the Pacific theatre.

Charles S. Block, B.Ch.E., class of 1949, Polytechnic Institute of Brooklyn, has also joined the staff as research assistant in the resins and plastics section.

• Shrinking Range

The James Hunter Machine Company, North Adams, Mass., has announced the modern London Shrinking unit, a unit said to be guaranteed to give better production and improved quality at lower cost.

This modern continuous range is said to differ from any other machine now available. From wetting out tank to dryer delivery, the unit has been designed to handle cloth with a minimum of tension and to insure controllable shrinkage.

This unit is said to eliminate troubles commonly encountered with conventional loop-type or old-style dryers, namely, stretching caused by the weight of the loop and scalloped selvedge.

Cloth in the Hunter dryer is carried horizontally through the dryer on a special conveyor. Hunter's patented uniflow air system is utilized to insure even drying from side to side. This air is blown through the cloth on both the back and the face to prevent any chance of shadiness. Positive circulation is provided by special fans (eight per section). The air is heated by steel extended surface heaters adequately screened to catch lint and flock.

The entire unit consists of a stainless steel wetting out tank equipped with stainless steel ball bearing idler rolls. This tank is used for cold water shrinking or for the application of waterproof or resin finishes. Only with a positive dip and immersion followed by a squeezing action, which thoroughly impregnates the cloth, can accurate shrinkage be guaranteed and controlled.

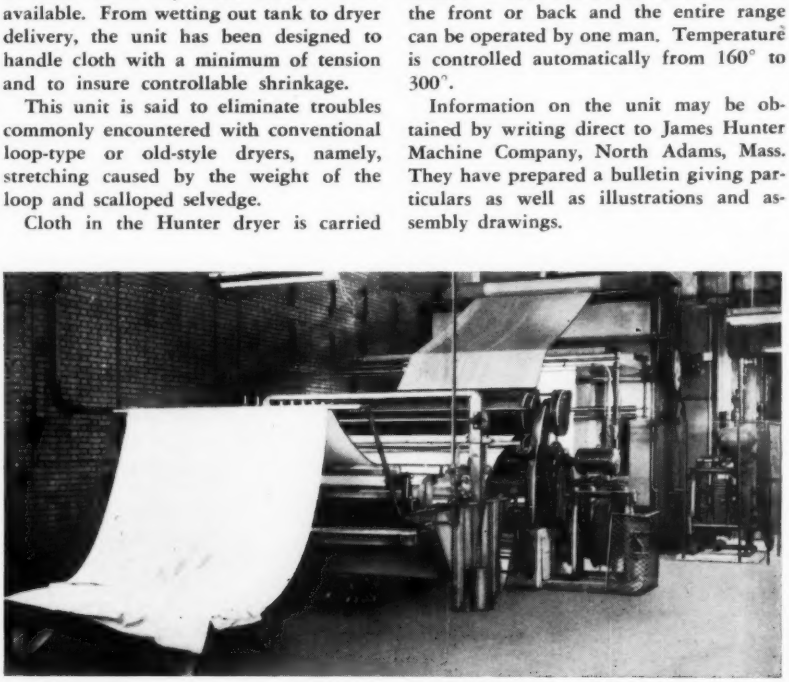
The goods are then extracted by means of heavy-duty pneumatic squeeze rolls. This pad which can apply over ten-tons pressure thoroughly impregnates all the fibers with any special finishing agent involved.

A variable speed is used to control the speed of the entire range and can be operated to change the speed by pushbutton control.

Shrinkage is obtained and controlled by a variable speed roll as the cloth enters the dryer. From 4% to 10% can be obtained in the warp with a minimum width shrinkage at continuous speeds from 10 to 50 yds. per minute.

The dryer is easily accessible for maintenance. Cloth can be delivered either at the front or back and the entire range can be operated by one man. Temperature is controlled automatically from 160° to 300°.

Information on the unit may be obtained by writing direct to James Hunter Machine Company, North Adams, Mass. They have prepared a bulletin giving particulars as well as illustrations and assembly drawings.



Hunter Shrinking Range

Leland I. Doan

• Dow Appointment

The Dow Chemical Company announces the appointment of Leland I. Doan, president, to the Board of Directors of the Saran Yarns Company, Odenton, Maryland. The appointment was made at a recent meeting of the stockholders in that city.

Doan's membership on the Board fills the vacancy created by the death of Dr. Willard H. Dow.

Saran Yarns Company is jointly owned by Dow and the National Plastic Products Company, extruders of saran monofilaments used in water-resistant woven fabrics.

• New "Mag-Mix"

Fisher Scientific Company, 717 Forbes St., Pittsburgh, Pa., announces a much more powerful magnetic stirring device, the new "Mag-Mix", is now available for stirring liquids in a wide variety of beakers, flasks and other containers. It operates on the same principle as earlier models—producing agitation by means of induced magnetic force—but will stir liquids as viscous as S.A.E. 90 (at room temperature).

The new "Max-Mix" is comprised of a heavy-duty motor with permanent Alnico magnet attached to its shaft. Stirring bars placed in containers and on housing above the revolving magnet are turned at any speed desired by adjusting the external rheostat.

Stirring bars furnished are enclosed in glass and in acid-resistant plastic which can be employed at temperatures up to 190° C. Stirring action can be effected in flat or round-bottomed flasks, in non-magnetic metal containers and through heating mantles. The mixer is particularly essential for stirring liquids under pressure or vacuum in closed systems.

• Taylor Resigns

Charles W. Taylor has resigned his position as General Superintendent of the American Thread Co., Hampton Yarn Division, Easthampton, Mass., and has accepted a position as Manager at the Kilburn Mills, New Bedford, Mass.

Mr. Taylor was previously with the Renfrew Mfg. Co., Adams, Mass., as Chief Dyer and later became Superintendent of the Hampton Co., Easthampton, Mass., and he is one of the pioneers of rayon cake dyeing. The Hampton Co. liquidated in November 1945 and was taken over by the American Thread Co. and Mr. Taylor was retained as Superintendent giving him a total of 24 years service with two of Easthampton's largest firms.

• Du Pont Transfer

R. Jack Manning, of the sales division of the Du Pont Company's Ammonia Department, has been transferred from Wilmington to New England to work more closely with the paper, textile, and leather industries. He will make his headquarters in Needham, Mass., in covering the six-state area.

• New Department

A new "Government Service Department" to coordinate information, sales and service to Federal, State and Municipal Governments was set up this month by Antara Products, General Aniline & Film Corporation, manufacturers of synthetic detergents, wetting agents, emulsifiers, dispersants and Carbonyl Iron Powders.

Brought about by Antara Products' policy of service, the new department is under the direction of John P. Conrad. The move provides for a uniform method of handling government business and assures the proper organization for sales and service to its agencies.

A complete file of Government specifications applicable to Antara Products has been set up by the new department. Along with descriptive and technical material to handle inquiries, Mr. Conrad's new organization also has complete facilities for streamlined bidding and prompt, adequate service on any Government need in the surface active agent field.

• Armour Service Office

The Chemical Division of Armour and Company has announced the establishment of an Eastern Sales and Technical Service Office at 120 Broadway, New York 5. This office is under the supervision of Ervin W. Segebrecht who was previously a member of the sales and technical department at the Chemical Division's Chicago office.

The Eastern Sales and Technical office is set up to provide the Eastern District with a source for quotations, samples or technical data on fatty acids and their derivatives.

Roy S. Hager

• Hager in Regional Sales

Roy S. Hager has become Regional Sales Representative for Lee Dye Works, Inc., Philadelphia, it was announced by Lou Finkel, President of the company. Mr. Hager will cover the states of Pennsylvania, Maryland, Delaware and New Jersey.

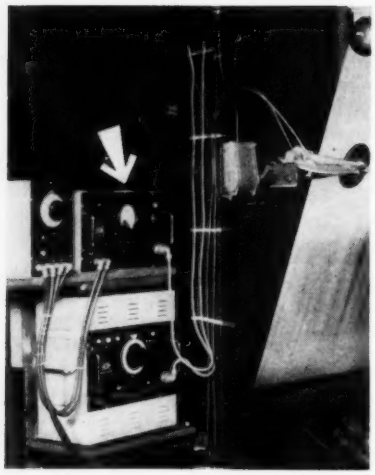
For six years, Mr. Hager was Production Director of Tohickan Hosiery Mills, of Quakertown, Pa., Quality Control Supervisor of Prestige Hosiery Company and Artcraft Hosiery Company, of Philadelphia. Prior to these assignments, he was associated with the duPont Company's chemical and explosives division in a technical capacity.

• Broader Membership in A.A.S.G.P.

Announcement was made July 12th of the broadening of membership in the Association of American Soap & Glycerine Producers, Inc., to include manufacturers of synthetic glycerine and of synthetic detergents. This action was voted recently by the Board of Directors at a meeting in New York.

"The inclusion of synthetic detergent manufacturers should do much to advance the work of cleanliness education undertaken by the Association," said Roy Peet, Manager of the Association, in making the announcement. "The Association was set up for the promotion of soap and kindred products, and a large number of its members are now marketing synthetic detergents as well as soaps.

"The extension of membership to companies making synthetic detergents makes possible a greater effort to advance the cleanliness standards of our people, in terms of personal, household, and community cleanliness. Successfully developed, it means higher consumption and greater sales of cleansing products of all types."



Fielden Automatic Controls

• Automatic Moisture Control

Three more textile machinery manufacturers are now recommending the Drimeter Fielden Automatic Control and Auxiliary Equipment and are prepared to install it on their drying machines, according to Ralph V. Coles, vice-president of Fielden Electronics, Inc., 1171 New York Avenue, Huntington Station, N. Y.

The manufacturers are Winsor & Jerould Manufacturing Co., Providence, R. I.; H. W. Butterworth and Sons, Philadelphia, and Morrison Machine Company, Paterson, N. J. Recommendation of the Drimeter by the James Hunter Machine Company, North Adams, Mass., has been announced previously.

The Drimeter and other Fielden electronic equipment constitute a completely automatic system for moisture control in fabric drying or sizing. The Drimeter measures moisture content continuously to within 1 percent of accuracy. It consists of an hygrometer unit and an electrode unit with two plates between which the fabric or yarn passes. The automatic control mechanism (below the Drimeter hygrometer) regulates machine speed according to Drimeter moisture measurements. The calibration unit (to the left of the Drimeter hygrometer) standardizes the Drimeter to any weight of material. The Drimeter can be used without the supplementary units, if desired.

It is suitable for all types of yarn and fabrics and is intended for use with slashers as well as drying machines. Readings, it is claimed, are not affected by size, salts, dyes or other finishing materials.

• Staff Conference News

The recent textile school staff conference, held under the auspices of the Lowell Textile Institute, was highlighted by the demand of both representatives of industry and education for a broader base of textile education than mere technical efficiency. Speakers, before the more than 125 educators from 8 U. S. textile schools gathered at Lowell, Massachusetts, emphasized the need of turning out men capable of dealing with the human problems of industry and exercising powers of leadership rather than effective technicians.

The need for a more rounded and broad gauge graduate was translated into a demand for a broader curriculum, emphasizing the humanities and social sciences as well as the usual courses in science and textile processing.

The Conference, the first of its kind in U. S. textile education, brought together representatives of the teaching staffs of both Northern and Southern textile schools to discuss their mutual problems and exchange ideas.

President Kenneth R. Fox of Lowell Textile Institute served as the host to the group which was housed in Lowell Textile's new dormitory during the three-day conclave. Schools represented besides Lowell Textile Institute were: Clemson College Textile School, North Carolina State College Textile School, Philadelphia Textile Institute, Rhode Island School of Design, New Bedford Textile Institute, Bradford Durfee Technical Institute and the Massachusetts Institute of Technology.

Conference mornings were devoted to speakers, and the afternoons to panel discussions on teaching problems in textile education.

Dean Frederick M. Feiker of the George Washington University, College of Engineering, opened the Conference by declaring that management must solve the human equation if the capitalistic system is to survive. He said in part:

"Primarily concerned with technological efficiency at one time, management handled its labor problem in a paternalistic and even feudal fashion. Management's role today is a constantly changing one, and the emphasis now must be on personnel problems. This is a sharp change from the day when industry paid little attention to the findings of the social sciences or to the ultimate happiness of the employees, and frequently indulged in exploitation unrestrained by any sense of public responsibility.

"Today, however, the human value must be reckoned with. In fact, if the capitalistic system is to survive, it must find an answer to the social and economic unrest of the present day without destroying individual initiative and enterprise, and the failure of the system to meet these problems will lead to Socialism or Communism.

"The industrial system is a collection of human beings whose desires far transcend the purely material motives, and we must stop thinking of industry as a machine, with financial returns the sole consideration.

"Too often our industrial enterprises are autocracies, with little room for the free development of the individual, and which makes but little use of the brains and initiative of the workers. The concept of free enterprise must be extended to the work bench if it is to be preserved in the market place.

"As future leaders of industry, technical school students must be imbued with the importance of the problem and with a sincere desire to learn how to live with people, and in this respect curricula must be altered to meet this requirement."

Three representatives of industry, James J. Gaffney, Jr., Industrial Relations Director of Newmarket Manufacturing Company; Frank Maria, Industrial Relations Director of Merrimack Manufacturing Company (Lowell); and Wallace McQuarrie, Industrial Relations Director of Abbot Worsted Company, then told the educators what industry expected in textile school graduates and how they fit into their organizations.

Stressing the importance of "front line" training in supervision, Mr. Gaffney said management has failed in the past in providing good secondary levels of supervision at the second hand and foreman level. Industry needs its future managers to start at the bottom in these jobs and textile school graduates should serve their apprenticeship there before rising to higher levels of management, he said.

Above all, he said, the schools should provide men with a breadth of background who can think clearly, express themselves well, form social judgments, discriminate sharply and communicate their thoughts to others.

In stressing only technology we are creating "nuclear giants and ethical infants," he continued and pointed to the success of many non-technical men with liberal backgrounds in technical supervisory positions.

"Our big problem," he said, "is to create, not technical leaders, but industrial statesmen."

The backward policies of industry in previous years, according to Mr. Maria, have not provided sufficiently trained young men with a broad humanistic approach to step into supervisory positions. The supervisor of today must provide real leadership, said Mr. Maria, as the workers have another source to which they can turn for leadership, namely, the unions. As a result, the industry today needs men who can accept total responsibility—to the workers, the public and the stockholders.

The emphasis in education must be on

humanics, continued Mr. Maria, stating it is more improtant who teaches and how he teaches than what he teaches. Vital personalities teaching in an enthusiastic manner, rather than formal courses, is the secret of teaching leadership and human values.

The problems facing the world and the textile industry today are political rather than technical, he said, and the schools must train men to cope with these problems. He emphasized the importance of the clinical approach to textile education, whereby the student works in the mill while studying the theory in the school and besides his technical education gets an understanding of human values by on-the-job training.

The importance of human values in textile school training was also stressed by Mr. McQuarrie, who emphasized the need for embryo managers to start at the production line and work up, to gain an insight into the problems of the workers.

Alert, sincere, discriminating men who can size up a problem and even anticipate it, he said, are the need of industry today. Such men must develop the full cooperation of their employees by wise leadership, he said, emphasizing that "a happy organization is a strong organization."

All three industrialists agreed that the attitude and approach of a supervisor was more important than mere technical competence and called upon the schoolmen to provide them with future leaders rather than technicians.

Professor Schwarz, world famous textile technolcgist from Massachusetts Institute of Technology, was the final speaker before the conference. Taking as his topic the training necessary to develop the research approach in solving the problems of the industry, Prof. Schwarz said that the trend to the all fiber mill and the increasing use of fundamental research to solve the age old problems of textile manufacture required an entirely new approach in the training of textile students.

"We must organize our courses in terms of basic operations regardless of fiber," he continued, "and discard the machine by machine approach now used in textile schools. We must stop teaching machines and teach the fundamental how and why of each type of operation, such as drafting, no matter which type of machine is used to accomplish it.

"Such training will develop the necessary understanding and judicial skepticism necessary for today's graduate in meeting the rapidly changing technological conditions of today," he said. "Past progress in the textile industry has been largely by a trial and error approach, and while such methods have their value, they are too slow to meet the rapid pace of today's scientific progress."

"The textile industry has by no means produced the optimum yarn or fabric as yet," he continued, and illustrated by a number of examples how very little we really knew in a fundamental sense about the simplest of textile operations. The yarns and fabrics of tomorrow must be "engineered" by men who build to specifications based on sound scientific knowledge obtained through fundamental research.

In the training of research men, Prof. Schwarz continued, we must give emphasis not only to technical competence but develop men capable of presenting their results effectively and convincingly. Too often, he said, research does not effect practical results due to the failure of the technician to "sell his work to others. To this end, he recommended courses in psychology, English composition and public speaking for the pure research man.

The panel discussions and exchanges of ideas in the methods and mechanics of teaching textile subjects were one of the most fruitful aspects of the conference. One of the most interesting panels featured an exhibition by Professor John H. Skinkle of Lowell Textile Institute of ingenious devices to simulate the effects of industrial bleaching, dyeing and finishing equipment on a laboratory scale for demonstration and experimentation. Such common and inexpensive articles as pressure cookers, clothes wringers, midget washers, fans, tin cans, hamburg grills, embroidery hoops, etc., were combined to produce the same effect on a small scale as expensive and bulky machines.

Other panel leaders were Prof. Gilbert R. Merrill and Prof. Vittoria Rosatto of Lowell Textile Institute, Prof. Elliot B. Grover, North Carolina State, Prof. Harold Sturtevant, Rhode Island School of Design, Prof. B. R. Koening and Prof. P. Theel of Philadelphia Textile Institute, Prof. Thomas H. Gourley, New Bedford Textile Institute and Prof. John G. Stickler, Bradford-Durfee Technical Institute.

Plans are under way to make the conference an annual affair with the different textile schools acting as hosts.

• Join American Cyanamid

Vincent V. Lindgren and B. R. Putnam, Jr. have joined the New Product Development Department of the American Cyanamid Company. Dr. Lindgren, who has been associated with the company for the past three years in its Stamford Research Laboratories, will devote his time to new product development activities. Putnam, who has been engaged in engineering development in the company's technical department, will be concerned with market research activities.

Model 8 Colorimeter

• New Model 8 Colorimeter

Coleman Instruments, Inc., 318 Madison St., Maywood, Ill., announces the new Coleman Model 8 Photo-electric Colorimeter. The Model 8 is a filter colorimeter in which have been incorporated many of the features of the famous Coleman diffraction-grating spectrophotometers, including: Rugged, taut-suspension Galvanometer for quick, accurate reading; Dual capability of direct-deflection reading, for speed, and potentiometric balance for precision; Removable and interchangeable scale panels; Wide choice of cuvettes, and a fine set of carefully selected and rigidly mounted optical filters.

Ask for Bulletin B-214.

• New Synthetic Detergent

Woonsocket Color and Chemical Co., Woonsocket, R. I., announces the release of Wooncomide W Ex, a nonionic synthetic detergent with outstanding properties.

It is a free flowing amber liquid congealing near 0°C. (32.5°F.), containing 91 per cent active organic ingredients, 9 per cent moisture and has a pH of 8.5-9 for a 1 per cent solution. It is said to be completely miscible in water in all proportions. Upon dilution, it passes through a gel stage but quickly regains its stability upon further dilution. It is claimed entirely stable on storage.

Other claims include use of 5 per cent or less for emulsifying most water insoluble solvents, combination of one part to six parts soap to produce a detergent completely unaffected by hard water, effective dispersal for many pigments and dyestuffs, and superiority to most commercial wetting agents.

As a dyeing assistant and levelling agent for cottons and rayons, the product is particularly recommended by the company for use with basic, vat thioindigoids, sulfurs, azo ointhrene, and direct colors.

• May Retires

Benjamin M. May, who started as a clerk and became one of the nation's outstanding figures in the development of rayon and later nylon and other synthetic fibers, retired on June 30 as general manager of the Du Pont Company's Rayon Department after 46 years of service. He will be succeeded by Robert L. Richards, who started with Du Pont as an operator at the Buffalo plant in 1923.

• National Meeting, ACS

The 116th national meeting of the American Chemical Society will be held in Atlantic City, New Jersey, September 18 to 23. Technical sessions will be held in Convention Hall and general headquarters will be at the Hotel Traymore. Technical meetings will start Monday morning, following sessions of the Board of Directors and various committees of the Society's Council on Sunday.

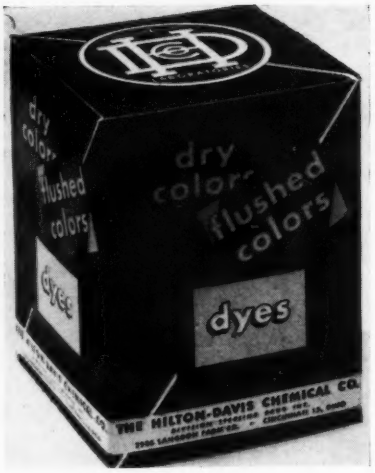
The presentation of the Priestley Medal to Professor Arthur B. Lamb of Harvard University, editor of the *Journal of the American Chemical Society* since 1918, will take place at a general meeting on Monday evening.

"Flameproofing Textiles" is the theme of a symposium to be held under the leadership of Dr. Gustavus J. Esselen of Boston, head of the Esselen Research Corporation and chairman of the American Section of the Society of Chemical Industry. A symposium on textile chemistry will be conducted by the Cellulose Division in cooperation with the Colloid Division, under the chairmanship of Professor Herman Mark, head of the Institute of Polymer Research of the Polytechnic Institute of Brooklyn. The Cellulose Division will cooperate also with the National Research Council in a symposium on the degradation of cellulose, dealing with research along the line that has produced a ban dage for internal use which can be absorbed by the body. The Paint, Varnish and Plastics Division will be the host division for a high polymer forum, at which advances in the study of these multiple molecular structures making up rubbers, fibers and plastics will be discussed.

A number of other divisions will also be convening during the week and it is anticipated that there will be an attendance of 10,000 chemists.

• Appointment Announced

Mitchell-Bissell Co., Trenton, N. J., announce the appointment of R. E. L. Holt, Jr., and Associates, Jefferson Building, Greensboro, North Carolina, as representatives in the Southern States. L. E. Wooten of Fort Mill, South Carolina, will remain with the organization as a special representative.



Hilton-Davis Carton

• New Sample Containers

A new carton in four colors has been adopted by Hilton-Davis, Cincinnati, for the five-ounce jars used for distribution of samples of its dyes, pigments, flushed colors and varnishes.

The carton was designed under the supervision of Nelson S. Knaggs, vice-president in charge of sales. Brilliant colors in name label rectangles are displayed against a dramatic black background. Diagonal white lines give the package added distinction. The insignia of the Hilton-Davis technical laboratories is carried on the top and bottom of the outer container and also lithographed on the lid of the glass jar, which is cellophane wrapped.

About 1200 different products, active standards in the company's line, are distributed in the containers as samples to interested customers and prospects.

• New Twist Test on Nylon

The United States Testing Company, with main laboratories at 1415 Park Ave., Hoboken, N. J., announced that a new test method for accurately determining twist in 15 denier and other monofilament nylon yarns has been developed. The new method is said to utilize a new type of take-up device built by the Company's instrument division. Twist tests on monofilament nylon are difficult, if not impossible, to make accurately using conventional twist testers. Representatives of industry requested the Company develop an accurate method in view of current interest in twisted monofilament nylon for hosiery and other applications.

• Joins A. Hollander

Daniel Frishman, formerly with the Harris Research Laboratories in Washington, D. C., has joined A. Hollander & Son, Inc., Newark, N. J., as Director of Research.

• Du Pont Appointments

Appointment of Andrew E. Buchanan, Jr., as assistant general manager of the Du Pont Company's Rayon Department, has been announced.

At the same time, R. L. Richards, new general manager of the department, announced that Donald F. Carpenter, who recently retired as chairman of the Munitions Board, will succeed Mr. Buchanan as an assistant manager of the department. Mr. Carpenter, prior to acceptance of his appointment in the National Military Establishment in April 1948, was vice president and assistant general manager of Remington Arms Company, a Du Pont subsidiary.

• Refresher Course

Registration of twenty-six students in the annual Refresher Course in Textiles and Testing Techniques was held on July 11 at the United States Testing Company, Inc. The members of this year's class represent sixteen different states as well as including two members from Canada. This is the twelfth year the company has conducted this course and as in the past, the enrollment comprises a select group from the fields of education, home economics and retailing.

Again this year the class will be given an intensified course in testing methods and procedures in the various phases of work covered in the extensive laboratories of the United States Testing Company, Inc. The course comprises a series of lectures supplemented by actual laboratory demonstrations conducted by many of the company's scientists and technical experts. An outstanding addition to the course this year will be a demonstration and descriptive lecture on the instruments and methods of tests in this company's newly equipped Radioisotopes Laboratory.

OBITUARY

EDWARD W. FREUNDT

Edward W. Freundt, 47 years old, Manager of the Chemical Division of Armour and Company, 31st Street Auxiliaries, died suddenly July 3, 1949, in Seattle, where he was vacationing.

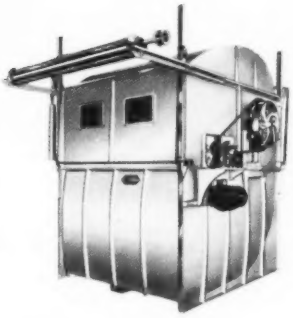
Mr. Freundt was employed by Armour and Company for the past 22 years, and was widely known in the chemical field. He was a member of the Paint, Varnish and Lacquer Association and had been President of the Mid-West Fats and Oils Club.

Mr. Freundt was also active in the Boy Scouts of America and in church work.

Surviving are his widow, Mrs. Florence Freundt, and a daughter, Miss Lois Freundt.

One of a series painted for Rodney Hunt by Ben Stephenson

FAMOUS FINISHES . . *Still unbroken is the trans-atlantic sailing record set by Wilson Marshall's "Atlantic," a three-masted schooner, in 1905. Competing for Kaiser Wilhelm's cup, the "Atlantic" covered the 3,000 mile course in 12 days, 4 hours, 1 minute — 22 hours ahead of its nearest rival, the German schooner "Hamburg."*



IN worsteds, the "famous finishes" of the Bachmann Uxbridge Worsted Corporation are known to textile men all over the world. In producing them, piece dyes play an important part. Both northern and southern plants of Bachmann Uxbridge use "Tru-Shade" Stainless Steel Dye Kettles. It can hardly be pure coincidence that wherever you find a mill famed for its finishes, you will also find equipment by Rodney Hunt. You are invited to turn the page for more specific information about "Finishing For Profit."

RODNEY HUNT

RODNEY HUNT

Established 1840

ORANGE 10, MASSACHUSETTS, U. S. A.

"Tensitrol," "Tru-Shade," "Slack Loop," "Wring-Master," and "Curve-of-Strength" are registered trade marks identifying textile finishing machinery manufactured exclusively by Rodney Hunt Machine Co.

Finishing For Profit

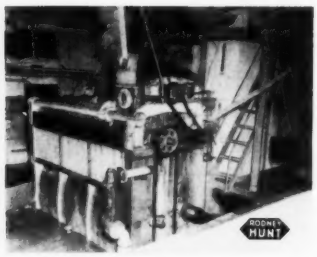
RODNEY HUNT

Established 1840

RODNEY HUNT MACHINE CO.

ORANGE 10, MASSACHUSETTS, U.S.A.

"Tensitrol" Rope Washer — Test Results



THE first "Tensitrol" Rope Washer to be tested in a mill underwent quite complete trials some months ago to determine its efficiency as compared to other washers. Test results speak for themselves. The actual figures are given herewith exactly as tabulated by the mill test engineer. Note the speed at which the tests were run and the small amount of water used.

The following tests were run on the Rodney Hunt "Tensitrol" Rope Washer and results are as indicated:

TEST No. 1 . . . Caustic Treated Dress Goods

Lots 4400, 4401, 4402 consisting of 10,420 yards of dress goods 4.73 yds/lb., were singed, mercerized, but not soured. The residual caustic left in the goods was washed on the trial machine.

Water used — *2,002.5 gals. at a rate of 40 gals/min.*
Steam used — *1,050 lbs. of water evaporated per hour running time.*
Average speed — *208 yds/min.*
Water temperature — *160°F.*

WASH RESULTS — *Expressed in % NaOH on the goods.*

Before Washing		After Washing	
Sample No.	*%*	*Sample No.*	*%*
1	.25	2	.025
3	.125	4	no traces
5	.275	6	no traces
7	125	8	no traces
Average .193		Average no traces	

TEST No. 2 . . . Caustic on Poplin

Poplin, Lot 6183, 3,570 yards and Lot 6201, 7,510 yards were mercerized, washed, but not soured.

Water used — *2,722.5 gals. at a rate of 53.4 gals/min.*
Steam used — *1,190 lbs. of water evaporated per hour running time.*
Average speed — *208 yds/min.*
Water temperature — *163°F.*

WASH RESULTS — *Expressed in % NaOH on the goods.*

Before Washing		After Washing	
Sample No.	*%*	*Sample No.*	*%*
1	.925	2	.05
3	1.0	4	.075
5	1.7	6	.1
7	1.125	8	.05
9	1.25	10	.075
Average 1.20		Average .07	

TEST No. 3 . . . Caustic Treated Poplin

Lot 6202—25,060 yards of Poplin, 3.04 yds/lb. was re-mercerized, but not soured.

Water used — *5,475 gals. at a rate of 47 gals/min.*
Steam used — *1,120 lbs. of water evaporated per hour running time.*
Average speed — *215 yds/min.*
Water temperature — *160°F.*

WASH RESULTS — *Expressed in % NaOH on the goods.*

Before Washing		After Washing	
Sample No.	*%*	*Sample No.*	*%*
1	1.275	2	.125
3	1.375	4	.125
5	1.725	6	.225
7	2.15	8	.225
9	1.95	10	.20
11	1.6	12	.125
13	1.55	14	.125
15	1.825	16	.175
17	1.5	18	.15
Average 1.661		Average .165	

TEST No. 4 . . . Caustic Treated Poplin

Lot 6273 — 24,176 yards of Poplin, 3.04 yds/lb. was singed, padded with 4.5% NaOH and washed.

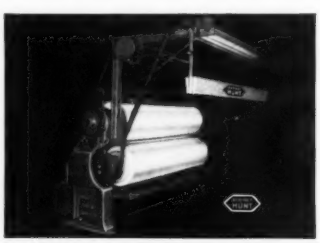
Water used — *5,310 gals. at a rate of 42.4 gals/min.*
Steam used — *1,085 lbs. of water evaporated per hour running time.*
Average speed — *193 yds/min.*
Water temperature — *163°F.*

WASH RESULTS — *Expressed in % NaOH on the goods.*

Before Washing		After Washing	
Sample No.	*%*	*Sample No.*	*%*
1	3.35	2	.10
3	2.75	4	.10
5	2.68	6	.23
7	2.48	8	.10
9	2.95	10	.13
11	2.98	12	.13
13	2.78	14	.13
Average 2.71		Average .13	

★ ★ ★

The Big Squeeze



HERE is the heaviest pneumatic squeezer ever made — A Rodney Hunt "Wring Master" Type RH Unit. 30 thousand pounds of pressure means the ultimate in degree of extraction. An exclusive and valuable feature is the fact that when pressure is released, the rolls automatically separate, thus eliminating the danger of rolls being left in contact which would result in a flat on the roll cover. Further information is available on request.

★ ★ ★

If further information is desired on the above subjects, please address your inquiries to the Rodney Hunt Machine Co., Orange 10, Massachusetts, U.S.A.

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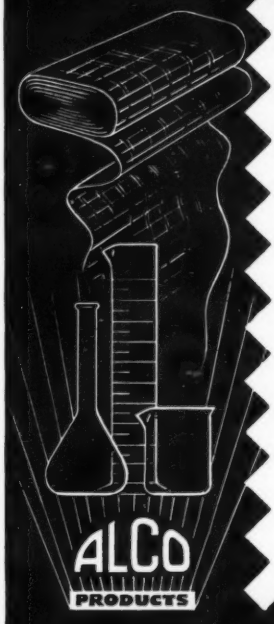

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YARDS OF **PILE FABRICS**
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A TRADE MARK OF STANDARD BRANDS INCORPORATED

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Launder·Ometers

Accurate data concerning color fastness, shrinkage, detergency, and resistance to washing and mechanical action is quickly provided by accelerated washing tests in Atlas Launder-Ometers — standard laboratory washing machines of the A.A.T.C.C.

Equipped with a new cabinet containing all switches, pilot lights, indicating and control instruments located directly behind the Preheating Loading Table, Launder-Ometers now offer easier and more precise control of tests.

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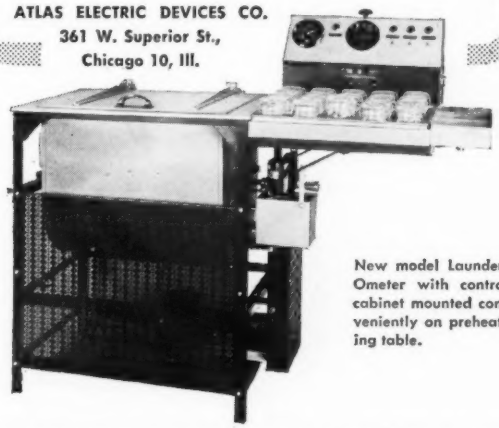
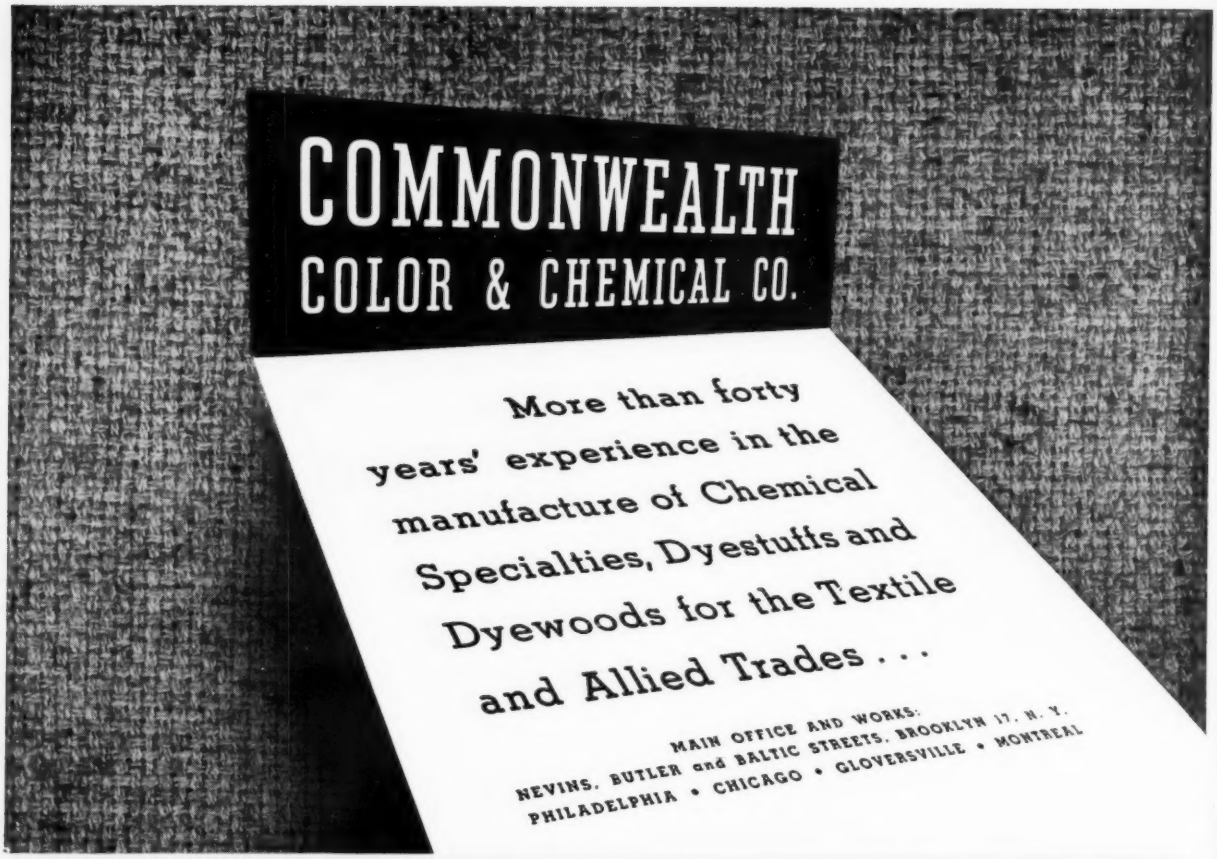


New model Launder-Ometer with control cabinet mounted conveniently on preheating table.

LAUNDER-OMETERS • FADE-OMETERS • WEATHER-OMETERS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Excellent Level Dyeing Properties
Very Good Fastness to Light

Recommended for producing fast shades on
Ladies' Dress Goods, Carpet Yarn and Upholstery Materials.

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Manufacturing Chemists
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Long experience ... accumulated knowledge
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Whichever way you look at it...

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With today's cost of manufacturing so high, it's the wise chemical buyer who considers his purchases from every angle. Price and specification alone are no longer basis enough for a buying decision. There is a good deal more a buyer can expect—speed of delivery, technical service, big-plant capacity to assure continued supply, knowledge of the industry and experience with its problems. On all these counts, more and more manufacturers agree, "it pays to specify Solvay."

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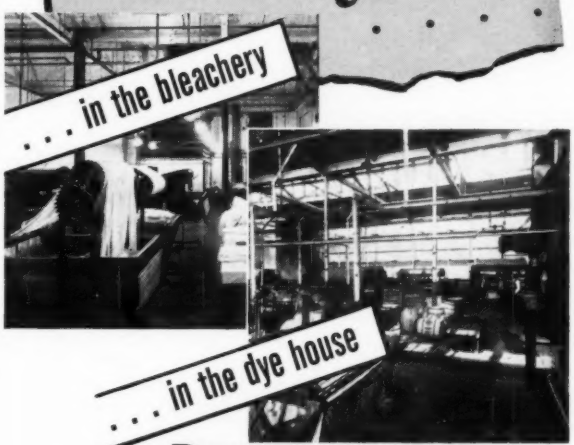

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SAVES More because it PROTECTS More

8 Attractive Colors
Proof against Acids, Alkalies, Oil, Water

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SMALL WARE
FOR THE DYEHOUSE
Ruggedly Built for SEVERE SERVICE

Welded, reinforced construction gives Blickman small ware extra durability to withstand hard daily use in the busy dyehouse. For sizes and specifications send for our small ware circular.

STAINLESS STEEL PAILS
Built to take a beating. Welded construction for extra strength. Round corners for easy, thorough cleaning. Made of #18 gauge stainless steel for corrosion resistance. Ears are formed under rolled rim of the pail and transmit part of the load to the rim. Capacity to 20 quarts. Write for Bulletin 7028.

STAINLESS STEEL BUCKETS
Easy to clean. For extra strength quarter inch thick reinforcing bands are welded at top and bottom. Handles of ½ inch diameter mild steel rod are welded to upper reinforcing band. Round corner bottom speeds cleaning. Built of heavy gauge stainless steel. Capacity to 100 gallons. Send for Bulletin 7029.

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Made to withstand rough handling. Hemispherical bowl of #16 gauge 18-8 stainless steel with #16 gauge stainless tapered handle-socket welded on. Capacities 1 pint to 4 quarts. Handle of 4 quart size reinforced. Send for Bulletin 7030.

Write for further information

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WANTED POSITION: Laboratory head and supervisor. Experienced in application work, research applied dyestuffs, technical problems, correspondence, catalogue work. 30 years' experience. Write Box No. 675.

POSITION WANTED: In any phase of the textile field. Chemist, Masters degree. Well trained with excellent background in organic and physical chemistry. Experience includes research, development and production of synthetic organics, detergents, plastics. Age 24, single, personable, imaginative, ambitious and accustomed to responsibility. Salary secondary to opportunity for advancement. All offers considered. Write Box No. 664.

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With following. To represent old established Dyestuff house. Excellent opportunity to connect with reputable firm. State experience. Strictly confidential. Write Box No. 666.

POSITION WANTED: Chemist, graduate L.T.I., other allied educational experience. Several years mill, office, and laboratory experience in cotton, wool synthetics, manufacturing and finishing. Any opportunity accepted. Age 26, Married—Family. References. Write Box No. 671.

WANTED: Dyer for narrow fabrics combination acetate and cotton, acetate and viscose and Nylon. Must be capable of taking over complete operations of dyehouse. State salary expected, qualifications and experience. Strictly confidential. Write Box No. 677.

WANTED—By Prominent Chemical Organization. Well established SALESMAN for TEXTILE CHEMICALS, SPECIALTIES and DETERGENT in NEW ENGLAND TERRITORY. Must have good sales experience and textile background. Unusual opportunity for right man. Write Box No. 681.

WANTED: Salesmen by prominent dyestuff manufacturer for mid-west territory, men 30 to 35 years of age, with textile school education and sales ambitions preferable. Excellent opportunity—salary basis. Give details and references in replying. Write Box No. 678.

POSITION WANTED—Textile Chemist, B.S. Chemistry, 6 months dyeing and finishing at textile college, some experience in a skein dye house. Age 25, married. Resume on request. Write Box No. 680.

WANTED: Dyestuff Salesman. Experienced. Small manufacturer in Southern New York State. Man in position to make investments and come in as partner preferred. Write Box No. 679.

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Full Fashioned, Half Hose or Any Fibre
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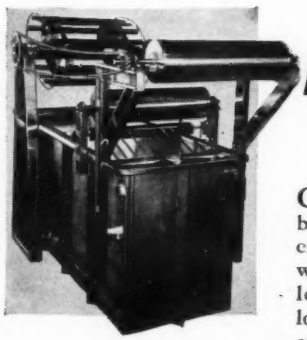
Keep operating costs down with this
ALL-MONEL
dye beck



Cadgene all-Monel* dye becks help you cut operating expenses in *three* important ways...longer equipment life, low maintenance costs, no losses from rust stains and contaminated dyes.

Rustproof, corrosion-resistant Monel withstands concentrated brines and caustic solutions; does not readily react with dyes; is easy to clean.

In Cadgene all-Monel becks, dye bath is heated by an open steam coil; bath temperature is thermostatically regulated. Sterling Speedtrol gives 8 to 30 rpm speeds. Tank, supports, contact surfaces made of #11 gauge sheet Monel with corrosion-resistant Monel welds throughout. Sizes available, 2 to 20 feet.

For further information and prices on Cadgene all-Monel dye becks, write to Cadgene Machinery Co., Paterson, N. J.
*Reg. U.S. Pat. Off.

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USE
KALEPON--W
as a protective colloid against alkalis and acids when scouring or dyeing wool

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Manufacturing Chemists
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WATER REPELLENT

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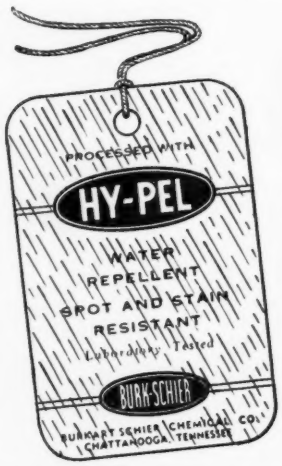

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RAYONS
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Hy-Pel treated fabrics are water repellent. They also resist spotting, staining and perspiration. The Hy-Pel process does not affect the appearance, texture or porosity of the fabric. Hy-Pel is a one bath water repellent and is applied on the quetch, padder, jig or beck. Efficient-Economical-Durable.

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BURK-SCHIER CHATTANOOGA, TENNESSEE BURK-SCHIER

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SYNTHETIC DETERGENT

BURKOL is a true detergent. That is, it possesses scouring and cleansing power to a marked degree, whereas the majority of the so-called synthetic organic detergents are primarily wetting agents.

BURKOL is economical to use, because it is low in cost and but a little is required for effective results. It is well suited for scouring and boiling off all types of textiles, including raw stock, yarns, hosiery, and fabrics. **BURKOL** may be applied in hard or soft water.

Goods scoured with **BURKOL** acquire a pleasing soft finish, which is well-retained through subsequent dyeing operations, so that usually no further finishing is required.

BURKART-SCHIER CHEMICAL CO.
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PERMA - PAR R

This excellent cation active finish which has served the textile industry for the past 10 years, has been improved to increase its efficiency and permit greater economy in use.

MAINTAINS COLOR BRILLIANCY WITH LESS COLOR LOSS

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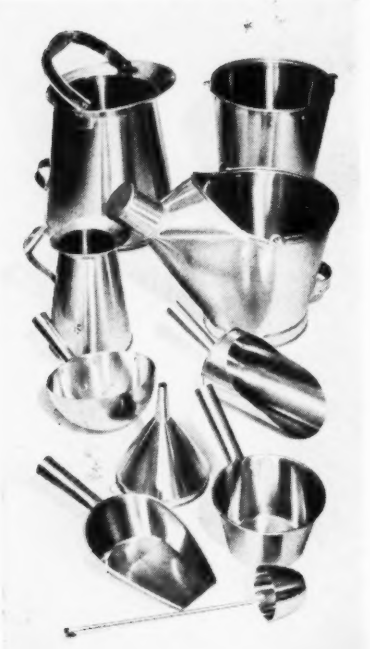

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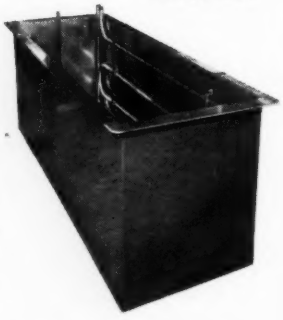

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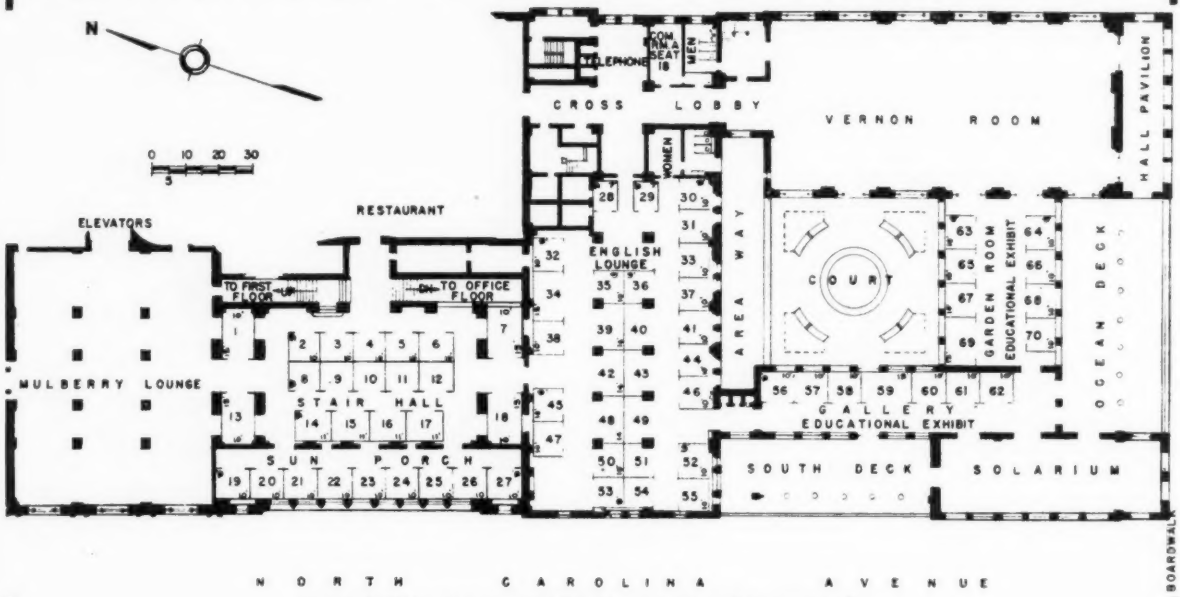

Exhibit Area at Chalfonte-Haddon Hall

The list of exhibitors at the Atlantic City Convention of the American Association of Textile Chemists and Colorists, Chalfonte-Haddon Hall, October 13-15, is growing daily. Exhibit space is open to the textile and allied industries, as well as institutions interested in textile education. There still is space available but don't wait until it's too late—get your reservation in early. The following firms and educational institutions had reserved exhibit space as of July 26th:

Booth	
1	Ciba Company
2	Swift & Company
3 and 4	H. W. Butterworth & Sons Co.
5 and 6	E. I. du Pont de Nemours & Co., Inc.
7	Alco Oil & Chemical Corp.
8 and 9	National Aniline Division, Allied Chemical & Dye Corp.
10 and 11	Reliance Electric & Engineering Co.
12	Fairchild Publications
13	Geigy Company
14 and 15	Smith, Drum Co.
16	Textile Bag and Specialties Co.
17	Calgon, Inc.
18	General Dyestuff Corp.
28	Monsanto Chemical Co.
29	Althouse Chemical Co.
31 and 33	Miller Motor Co.
32	National Milling & Chemical Co.
34	General Electric Co.
35	American Dyestuff Reporter
36	John Campbell & Co.
37	Textile World
38	Arthur H. Thomas Co.
39	Scholler Brothers, Inc.
40	Rohm & Haas Co.
41	Hart-Moisture-Meters
42	Sandoz Chemical Works, Inc.
43	American Aniline Products, Inc.
44	Jacques Wolf & Co.
45	Amalgamated Chemical Corp.
46	Venango Engineering Co.
47	Sidney Blumenthal Co., Shelton Looms
48 and 50	Virginia Smelting Company
49	American Viscose Corp.
51	E. F. Houghton & Co.
52 and 55	Calco Chemical Division, American Cyanamid Co.
57	Institute of Textile Technology
58	Lowell Textile Institute
59	Philadelphia Textile Institute
60	New Bedford Textile Institute
61	Ellen H. Richards Institute
63 to 69	A.A.T.C.C.
70	Atlas Electric Devices Co.

Information regarding exhibit space may be obtained from the Chairman of the Exhibits Committee: M. H. Klein, Sandoz Chemical Works, Tioga and Witte Streets, Philadelphia 34, Pa.

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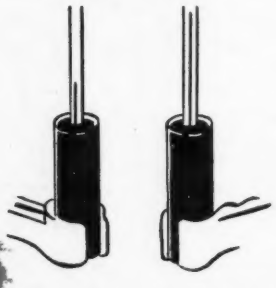

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